Hamilton Health Sciences

McMaster Children's Hospital

PEDIATRIC SURVIVAL GUIDE

For RESIDENTS, INTERNS and CLINICAL CLERKS

2011

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WELCOME TO McMASTER PEDIATRICS!

This handbook was designed for the large number of residents from a variety of disciplines that rotate through pediatrics during their first year of training. It may also be helpful for clinical clerks during their time on the pediatric wards, as well as for pediatric residents and elective students.

Hopefully this demystifies some of the 'pediatric specific' logistics, and gives a few practical suggestions for drug dosages and fluid requirements. This is intended only to act as a guideline for general pediatrics use, and some drugs, doses, indications and monitoring requirements may differ in individual situations. We would like to thank Mark Duffett (PICU pharmacist) for compiling and editing the pediatric formulary section and Dr. Moyez Ladhani for editing and supporting the production of this handbook.

We would very much appreciate any feedback, suggestions or contributions emailed to ladhanim@mcmaster.ca

McMaster PEDIATRICS CONTACT INFORMATION

Wards

3B Back	76123, 76120
3C North	76345, 76344
3CSouth	73388, 76972
L2N	73753
NICU	76147
L & D	75050
4C Nursery	76354
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Clinical

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Short Stay	75564
Radiology	75279
MRI	75059
CT scan	73728-room 75287-reception
Ultrasound	75316
EEG 4U	76363
ECHO 2F	75097
GI – pH probe	

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Stat Lab	76303
Bloodbank	76281
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Bed Booking	75106
Health Records	75112
Computer support	43000
Appointments	75051
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Room bookings	22382

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willsoc@mcmaster.ca
Family med residents: Jennifer Frid 76024
frid@mcmaster.ca
Wendy Milburn 905-575-1744 x203
milburn@mcmaster.ca

Chief Residents – Pediatrics

macpedschiefs@gmail.com

PAGING

To page someone from within the hospital:

1. dial 87
2. enter person's pager number (4 digits)
3. enter call-back extension (5 digits)
4. enter priority code (* * then 1 for CODE/STAT, 2 for ROUTINE, 3 for ANYTIME, 4 denotes PHYSICIAN paging)

If you don't know their pager #, wish to leave a typed message or to wait on an outside line: call **x76443**

To inactivate/activate your own pager:

1. dial 87
2. enter your own pager #
3. dial 08

RTAS (Rapid Telephone Access System)

- For retrieval of dictated radiology reports not yet typed on Meditech

Internal access x75077
To access from outside (905) 521-5077

Security code 4123#
Patients ID # (9 digits)

1 – stop report
2 – resume play
3 – rewind
4 – slow down speed
5 – disconnect from system
6 – speed up
8 – next report
0 – go to start of report

Division of General Pediatrics
CTU 1, 2 and 3 Weekly Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
7:15-7:45	Handover	Handover	Handover	Handover	Handover
8:00-9:00	Division of General Pediatrics Grand Rounds 4E20	Resident Run Teaching MDCL 3020	Orientation/ Case Based Teaching	Teaching for Pediatric Residents MDCL3020, rest of team, see patients	PICU Rounds
9:00-10:30 (9:15-9:30)	See Patients (CTU Huddle)	See Patients (CTU Huddle)	See Patients (CTU Huddle)	See Patients (CTU Huddle)	See Patients (CTU Huddle)
10:30-12:00	Ward Rounds	Ward Rounds	Ward Rounds	Ward Rounds	Ward Rounds
12:00-13:00	**Lunch**	**Lunch**	**Lunch**	Grand Rounds	**Lunch**
13:00-15:00	Patient Care	*MDR 1& 2 Patient Care	Patient Care/AHD	*MDR 3 Patient Care	Patient Care
15:00-16:00	Specialty Teaching/ Bedside Case	Specialty Teaching	AHD	Teaching Sessions/Bedside Case/ Radiology Rounds	Long Cases
16:00-16:30	Evaluations	Evaluations	AHD	Evaluations	Evaluations
16:30-17:00	Handover	Handover	Handover	Handover	Handover

Please refer to attached document for details of each of the above.
***MDR = Multidisciplinary Rounds.**
The detailed monthly schedule for this can be found at
www.macpeds.com
Updated: November 2010

Division of General Pediatrics CTU 1, CTU 2, CTU 3 Weekly Schedule

Handover:

Handover is to take place from 0715-0745 hrs. It is therefore important to complete a succinct handover within the allotted 30 minutes. The senior residents should touch base with the charge nurses from 3B/3C/L2N to review potential discharges.

CTU Huddle/Discharge Rounds:

CTU Huddle will take place each morning from 09:15 – 09:30 am Monday to Friday in the 3C conference Room. The two ward Attendings, the Senior Residents and Nurse Managers will attend and discuss potential discharges and bed management. Patients that can go home will be identified at this time and discharges for these patients should occur promptly. Discharge planning should always be occurring and patients that could potentially go home should be discussed by the team the night before. This would then be the time to ensure that if those patients are ready that the patients are discharged. The Team 3 Attending will huddle with the NICU at 9:50 to discuss potential discharges and transfers in the Communication Room in NICU.

See Patients:

During this time the team will see their assigned patients. The chart and nursing notes should be reviewed to identify any issues that have arisen over night. The patient should be seen and examined. All lab work and radiological procedures that are pending should be reviewed. The house staff should then come up with a plan for the day and be ready to present that patient during ward rounds. It is not necessary that full notes be written at this time, as there will be time allotted for that later in the day.

Ward Rounds:

During ward rounds the attending paediatrician, with/without Senior Resident, and house staff will round on patients for their team. These are work rounds. All efforts should be made to go bedside to bedside to ensure that all patients are rounded on. Some spontaneous teaching during rounds

and at the bedside can occur during this time, however there is allotted time for that later in the day.

Team 1 will start on 3B then proceed to 3C
Team 2 will start on 3C then proceed to 3B
Team 3 will start on L2N then 4C

Case Based Teaching Team 1 and Team 2:

There is allotted time for case based teaching. All three teams are required to attend. The residents on the team are responsible for this case based teaching. A Junior Resident should be assigned by the Senior Pediatric Resident in advance to present at the case based teaching. The Junior Resident should present the case in an interactive manner to the rest of the teams. After which the Senior Resident should lead a discussion on that topic and the staff Pediatrician will play a supervisory role. The attending pediatricians are to attend these rounds to provide input. Please note that the case based teaching times from 8:00-9:00 hrs are protected times for learners on the teams. All work is to stop at 8:00 hrs and all 3 teams are to meet at that time. If at all possible all pages to learners at this time should be avoided. Please note: patient care does take priority; patients waiting for ER consults etc should not be delayed to attend these rounds. Nurses and other health care professionals are welcome to attend these rounds.

Resident Run Teaching:

Time has been allotted for resident run teaching on Tuesday mornings 0800-0900 hrs. These should begin promptly at 0800 hrs. The schedule for these sessions will be put out separately. These sessions will review guidelines and protocols of the CPS and the AAP.

Protected Teaching for Pediatric Residents:

On Thursday morning there will be protected teaching for the pediatric resident ***ONLY***. The rest of the team, at this time, will continue with discharge rounds and seeing patients. These sessions will include staff led case based teaching/bedside teaching, neonatal mock codes, and CanMEDS based sessions. The second Thursday of each month will be morbidity and mortality rounds and all learners should attend these.

Patient Care:

During this time residents will follow through with decisions made during ward rounds. They will finish charting on patients. This is also the time for them to get dictations done and to complete face sheets.

Teaching Sessions:

There are various teaching sessions throughout most days on the CTU. Please refer to the CTU teaching schedule for locations – this will be posted online as well as on the wards.

- Monday morning will be the Division of General Pediatrics Grand Rounds; these will be in room 4E20. (8am-9am)
- Mondays from 15:00 to 16:00 – there will be either Bedside Teaching (see below) or Subspecialty teaching sessions. It is the goal during this time to get various specialties to come in and teach around patients that are on the ward.
- Bedside case teaching. All three teams are to meet at 15:00 hours on 3C. At this time the attendings will split the group up and do bedside teaching. The attendings will decide how to split the group up to get the maximum out of these sessions. Although the Senior Pediatric Resident is expected to lead these sessions, the Team 1 and 2 attendings are expected to be there and provide input.
- Tuesdays from 08:00 to 09:00 – Resident run teaching as described above.
- Tuesdays from 15:00 to 16:00 - There will be sub-speciality teaching for the first 3 Tuesdays of the month.
- Wednesdays from 08:00 to 09:00 – The first Wednesday of the month will be an orientation session for BCTs, Family Med Residents and PGY 1 Pediatric Residents to familiarize them with the expectations of the rotation. This is mandatory for all new residents on the CTU service including pediatric residents who have not done wards yet. Case-based teaching run by Team 1 and 2 on the 2nd and 3rd Wednesdays and the 4th Wednesday of the month will be Peds. Cardiology teaching – "Heart to Heart".
- Wednesday is Academic Half Day
- Thursdays from 08:00 to 09:00 – Protected teaching for Peds Residents Only

- Thursdays from 15:00 to 16:00: The Thursday teaching will include lab teaching, asthma education, Radiology Rounds and occasionally bedside teaching.
- Friday is for long cases. This would be the opportunity for the attending paediatricians to do at least one long case examination with the pediatric residents, if possible. All efforts should be made to ensure that this does occur. However, depending on how busy the teams are there is not a mandatory expectation.
- Nurses and other health care professionals are welcome to attend these rounds.
- Attendings are required to attend the following rounds unless clinical or administrative responsibilities prevent them from attending:
  - St. Joseph's Pediatric Grand Rounds teleconferenced in 4E20
  - All subspecialty teaching on Monday and Tuesdays
  - Bedside teaching
  - PPR and Morbidity and Mortality rounds
  - Case Based teaching on Wednesday mornings

Evaluations:

Time is left in the schedule for evaluations. This would be the time to give residents mid-way evaluations, as well as end of rotation evaluations.

Handover 1630 hrs:

Handover will occur to the on-call team.

Orientation:

At the beginning of each month, usually the first Wednesday of the month, there will be an orientation session for the BCTs, Family Medicine Residents and PGY 1 Pediatric Residents. At least one of the three attendings will meet with learners to discuss objectives and expectations. The Chief Pediatric Residents will run the orientation. **This orientation session is mandatory for new learners on the CTU rotation.**

Multi-Disciplinary Rounds:

Team 3 will occur on Thursdays. The L2N patients will be discussed from 1300-1400 in the Communication Room in NICU. Team 1 and 2 MDR will occur on Tuesdays. Team 1 will be from 1300-1330; Team 2 will be from 1330-1400.

Updated November 2010

RESOURCES

Handbooks/Pocketbooks:

- *Hospital for Sick Children Handbook* (11th ed, 2010).
- *Harriet Lane Handbook* (1999): John Hopkins Hospital, Dept of Pediatrics.
- *Pediatrics on Call.*
- *Pediatric Drug Dosage Handbook* (on most wards)

Texts:

- *Nelson Essentials of Pediatrics* (4th ed): Behrman R.E. and R.M. Kliegman.
- *Rudolph's Fundamentals of Pediatrics* (3rd ed, 2002): Rudolph, A.M. et al.
- *LANGE Current Pediatric Diagnosis and Treatment* (16th ed, 2002): Hay, W.W., A.R. Hayward et al.
- *Pediatrics: A Primary Care Approach* (2nd ed) – STARS series: Carol D. Berkowitz.
- *Pediatric Clinical Clerkship Guide*

Clinical Skills:

- *Pediatric Clinical Skills* (3rd ed): Richard A. Goldbloom.

Journals (all accessible via e-Resources at McMaster Libraries)

- *Pediatrics In Review*. Monthly publication by AAP (American Academy of Pediatrics), consisting of review articles and case presentations
- *Pediatrics*. Monthly publication by AAP.
- *Journal of Pediatric & Child Health*. Monthly publication of CPS (Canadian Pediatric Society).

WEBSITES

McMaster Pediatrics Residency Program

http://www.macpeds.com

Our residency program site that includes staff & resident presentations, subspecialty orientation materials, policy statements and our favourite links. Call schedules are also posted here in a password-protected area.

Canadian Pediatric Society - *Position Statements*

http://www.cps.ca/english/publications/StatementsIndex.htm

The main site also directs you to their journal (*Pediatrics and Child Health*) and a separate site for information for parents (Caring for Kids).

American Academy of Pediatrics (AAP)

http://www.aap.org/pubserv

The American equivalent of CPS, which has an expansive collection of practice guidelines and policy statements that are widely quoted.

Pediatrics in Review Journal

http://pedsinreview.aapjournals.org

An excellent resource for review articles on common problems and an approach to.... whatever! Online back to January 1997 in full text and pdf formats. Accessed through a McMaster e-Resources.

CDC Growth charts

http://www.cdc.gov/growthcharts/

SOGC Guidelines (Society of Obstetricians and Gynecologists of Canada)

http://www.sogc.org/SOGCnet/sogc_docs/common/guide/library_e.shtml

Evidence-based guidelines created by the SOGC, as indexed by topic area. Some of these are quite helpful in Level 2 Nursery and other newborn settings. Many others are quite helpful during your obs/gyn rotation!

Up-to-date

http://www.uptodate.com

An evidence-based summary of common topics in adult medicine and pediatrics. Available only on McMaster Hospital / Library computers, via HHSC Intranet.

MORE WEBSITES …

Dr. Ross Pennie's homepage - Peds Infectious Disease

http://www.fhs.mcmaster.ca/path/faculty/pennie.htm

Home of the Antibiotic Safety Zone and a new Immunization schedule.

Harriet Lane Links

http://derm.med.jhmi.edu/poi/

From the editors of the Harriet Lane Handbook is a full listing of all sorts of web links you could ever want within pediatrics.

Motherisk Program

http://www.motherisk.org/

A comprehensive program for evidence-based online information about the safety or risk of drugs, chemicals and disease during pregnancy and lactation based at Hospital for Sick Children.

National Advisory Council on Immunization (NACI)

http://www.phac-aspc.gc.ca/naci-ccni/tor_e.html

http://www.phac-aspc.gc.ca/im/ptimprog-progimpt/index.html

A program of the Canadian Public Health Association for educating parents and families, as well as health care professionals about the benefits and guidelines regarding childhood immunizations. Also links to Canadian Immunization Guide (2002).

Canadian Institute of Child Health (CICH)

http://www.cich.ca/index_eng.html

As their mission statement states "Dedicated to promoting and protecting the health, well-being and rights of all children and youth through monitoring, education and advocacy."

PDA resources

- **HSC Handbook** and **Harriet Lane** both available on PDA

- **Eponyms** (http://www.healthypalmpilot.com) – free, short descriptions of genetic syndromes

- **Epocrates** (http://www.epocrates.com) – free, drug database

DICTATIONS – Hamilton Health Sciences Corporation

x5000 to enter, (905) 575-2550 externally

Enter Author ID (#)

Enter site (#)
11. General
12. Henderson
13. MUMC
14. Chedoke

Enter Report Type (#)
21. Consultation
22. Discharge
3. Operative Report
4. Pre-op History & Physical
25. Clinic Note

Enter Chart Number (#) – the ID # after the 'M'

Enter Patient Type (#)
1. Inpatient
2. Outpatient
3. ER
4. Child & Family

Press 2 to dictate, *5 to disconnect

1. Hold
2. Pause/Continue
3. Skipback/Play
4. Fast Forward (44 to move to end)
5. Disconnect
6. Prioritize
7. Rewind (77 rewind to beginning)
8. End Report

For each report:
- your name, patient name (spelling if difficult)
- chart number, work type, copies to (FD, pediatrician, consultants, MRP, etc)

PEDIATRIC STAFF – PAGERS AND OFFICE NUMBERS

General Pediatrics	**Pager Number**	**Office Number**	
Babic, Bojana	7638	664-9992	
Cheung, Wendy	7522		
Ernst, Caroline	3339	522-8915	
Federici, Julie	7347	333-5437	
Fitzpatrick, Kelly	523-3167	575-0611	
Gambarotto, Kathy	572-8681	575-0611	
Giglia, Lucy	7536	523-6766	
Hallett, Kristen	2089	664-9992	
Hunter, Andrea	7561	575-0611	
Ladhani, Moyez	2040	x75639	
Latchman, Andrew	2555	75392	
Lim, Audrey	3449	523-1209	
MacNay, Ramsay	2031	575-0611	

Orovec, Natalie	645-8573	664-9992	
O'Toole, Frank	524-7609	575-0611	
Roy, Madan	2023	x75639	
Seigel, Sandi	3008	628-0054	
Wahi, Gita	905-540-2662	523-7920	
Wahi, Shobha	572-1464	523-7920	
Sub-Specialist	**Pager**	**Office Number**	**Specialty**
NICU			
Dutta, S	2116	X 73689	Neonatology
El Helou, S	2560	x73903 or 73490-Menika	Neonatology
Fusch, C	2045	x76763 or 75721-	Neonatology
Marrin, M	2705	x76648 or 73490-Menika	Neonatology
Murthy, P	2140	x76486 or 73490-Menika	Neonatology
Shah, J	1502	x73490	Neonatology
Shivananda, S	2403	x73489/73490	Neonatology
Thomas, S	2747	x76487 or	Neonatology

		76959-Diane	
Watts, J	2710	x73623 or 75607-	Neonatology
Sub-Specialist	**Pager**	**Office Number**	**Specialty**
Surgery			
Ayeni, F	2104	x73532	Ortho Surgery
Bailey, K	2766	x75231	General Surg
Bain, J	2628	x73222	Plastic Surg
Baronia, B	2743	x75237	Neurosurgery
Braga, L	76433	x73777	Urology
Burrow, S	2133	x73173	Ortho Surgery
Cameron, B	2317	x75231	General Surg
DeMaria, J	76443 paging	x73777	Urology
Fitzgerald, P	2340	x75231	General Surg
Flageole, H	76443 paging	x75244	General Surg
Gunnerson	76443 paging	x75237	Neurosurgery
Korman, B	2600	x75246	ENT
Peterson, D	2035	x73173	Ortho Surgery
Sabri, K	76443 paging	x76662	Ophthalmology
Singh, S	2577	x75237	Neurosurgery
Strumas, N	n/a call office	x73594	Plastic Surg

Walton, M	2626	x75244	General Surg
Sub-Specialist	**Pager**		**Specialty**
Almeida,C	through paging-(iphone)	x75242	Cardiology
Al Shabanah, H	2099	X 75155	ER
Anchala, K	2027	x75155	ER
Arora, S	2066	x73680	Nephrology
Athale, U	2118		Hem-Onc
Barr, R	2712	x75624 or 73464-Wendy	Hem-Onc
Belostotsky, V	76443 - paging	X75635	Nephrology
Brill, H	2476	x73455	GI
Callen, D	2038	x75686	Neurology
Carter, T	2644	x73508	Development
Chan, A	289-259-1808	x73531 or 73464-Wendy	Hem-Onc
Choong, K	2865	x76651	PICU
Cupido, C	2327	76610	PICU
Dent, P	2720	x75382	Rheumatology
Dillenburg, R	2784	x75242	Cardiology
D’Souza, T	No pager	x75155	ER

Findlay, S	7308 or 972-1091	x73938 or 75658-Kim	Adolescent
Freitag, A	2357	76216	Respirology
Fulford, M	2011	x76307	Infectious Disease
Gilleland, J	2065	x76651	PICU
Gorter, J.W	2531	X27855	Developement
Grant, C	2036	x75643 or 75658-Kim	Adolescent
Harman, K	2887	x77212	Development
Hernandez, A	2645	x75155	ER
Holland, J	7106	x73716	Endocrinology
Huang, L	2026	x76610	PICU
Issenman, R	2768	x75637	GI
Johnson-Ramgeet,N	2995 or 905-974-6611	x75638 or 75658-Kim	Adolescent
Kam, A	2117	x75155	ER
Keith, P	2848	x76374	Allergy/Immun
Kozenko, M	2106	X73781	Genetics
Kraus de Camargo	76443-paging	x74275	Development
Lau, K	keithklau@bell.blackberry.net (STAT)	x75615	Nephrology
Li, C	2729	x73246	Genetics

Lieberman, L	2389	x73080 or 73428-Donna	Hem/Onc
Lloyd, R	2684	x76651	PICU
Mahoney, W	2713	x77605	Development
Malcolmson, C	2733	x75702	Gen Peds
McAssey, K	76443-paging	x 75702	Endocrinology
Meaney, B	317-2807	x73392	Neurology
Mesterman, R	2029	x73392 or 74275-Chedoke	Neurology
Mondal, T	2039	x75259	Cardiology
Morrison, K	No pager	x75702	Endocrinology
Niec, A	2637	x73268	Psych, CAAP
Nowaczyk, M	972-5531		Genetics
Pai, M	3703	x73464	Hem-Onc
Parker, M	2073	x76610	PICU
Pernica, J	2092	x76652	Infectious Dis.
Portwine, C	2119	x73440 or 73428-Donna	Hem-Onc
Potter, M	2370		Metabolics
Predescu, D	Through paging (iphone)	x75259	Cardiology
Ramachanran Nair	2360	x75613	Neurology
Ratcliffe, E	2059	x73455	GI

Ronen, G	2212	x75393	Neurology
Rosenbaum, P	2742	x27834	Development
Rosenbloom, E	76443- paging	X75155	ER
Saigal, Saroj	2732		Growth&Devel
Samaan, C	76443 - paging	73716	Endocrinology
Scheinemann, K	76443-paging or cell 416-970-5369	x73818 or 73428-Donna	Hem-Onc
Sherlock, M	76443 - paging	X73455	GI
Sulowski, C	76443 – paging	X75155	ER
Sweeney, C	2069	x73689	Nephrology
Tarnopolsky, M	2888	x75226	Neuromusc
VanderMeulen, J	76443- paging (on blackberry)	x73716	Endocrinology
Waserman, S	2358	x76374	Allergy
Wyatt, E	76443 - paging	X75607	ER
Zachos, M	7316	x75367	GI

ST. JOSEPH'S HOSPITAL PEDIATRICS

Hospital Contact Numbers

Auto attendant	(905) 522-1155
Switchboard	(905) 522-4941
Labour and Delivery	33251, 34157
NICU	36050
3 OBS (Well Babies Nursery)	33314
Paging	33311
Dr Sandi Seigel Deputy Chief St Joes Clinical	36039 seigels@mcmaster.ca
Dr. Moyez Ladhani *Deputy Chief Education*	36039 ladhanim@mcmaster.ca
Rosie Evered *Program Secretary*	36039 revered@stjoes.ca

Paging (33311) and Pagers:

- All paging done via switchboard attendant at extension **33311**
- Resident on-call usually carries pager # **412**
- Clerk on-call usually carries pager # **410**
- Page staff pediatrician on-call through paging (**33311**)
- McMaster assigns most pagers, check with program area
- If pager needed, sign out daily pagers at Switchboard

Library Services:

- 2nd Floor of Juravinski Tower
- Hours: MON, WED, FRI 8:00 AM – 6:00 PM
  TUES, THURS 8:00 AM – 8:00 PM
- X33440 or library@stjosham.on.ca

ST JOSEPH’S HOSPITAL ORIENTATION

DAILY SCHEDULE

7:30 AM	Handover (3OBS Conference Room across from NICU) Weekend/ Holiday Handover occurs at **8:30am**
8:00 AM	Teaching (Check monthly schedule for topics/location)
9:00 AM	Pre-round → examine patients, check labs
10:00 AM	Rounds with Attending Staff
12:00 PM	Lunch/ Teaching Session
1:00 PM	Finish Notes, orders, investigations, L&D, admissions, new consults in ER, discharges
4:30 PM	Handover (3OBS Conference Room across from NICU)

∗∗ All Clerks and Residents should attend:

- *BANA (Breastfeeding and Nutrition Assessment)* &
- *Asthma Education Clinic* for a half-day each, during their rotation.

Pediatrics Responsibilities:

- Attend any ‘at-risk’ deliveries in L & D
- 3rd floor Dowling Wing (OBS) newborn consults, from family physicians and midwives
- NICU inpatient coverage - 15-20 beds

Accommodation Services

On-Call Rooms:

- *Key*: sign out from Front Desk/ Switchboard, must be returned by 11:00 AM the next day
- *Location*: 2nd floor, Resident call room # 213
  → follow Gold Signs to Father O'Sullivan Research Centre
- *Additional Key*: unlock Washrooms + Showers or Code 2 4 3
- *Residents' Lounge* (Microwave & TV): Code 2 4 3
  → across from vending machines on 2nd floor before call rooms
- *Problems*: communicate to Switchboard or Mike Heenan x2218

Cafeteria Hours:

Charlton Cafeteria 2nd Floor, Mary Grace Wing	MON – FRI: 7:30 AM – 6:30 PM SAT – SUN: Closed
Garden Café @ CMHS	MON – FRI: 9:30 AM – 10:30 PM & 11:30 AM – 1:30 PM
Charlton Second Cup	Daily: 7:00 AM – 10:00 PM

Information Services

Clinical Brower Passwords & Training:

- Passwords obtained from: Computer Room
  5th Floor of Mary Grace Wing G507
  x32218 for Passwords
- Must accept password and confidentiality agreements by signature
- For additional information on Clinical Browser or training call:
  Shauna Stricker x35286

PACS Passwords & Training:

- PACS passwords same as Clinical Browser, except all UPPERCASE
- You may change your password once you have logged on
- PACS training is only offered at the Monthly Medical Learner Orientation Sessions. For session dates and times contact:
  Diane Larwood 34077

St Joes Dictation System

Telephone Dictation Instructions

If on-site dial: Extension **2078**
If outside the facility dial:
905 522-1155 Extension **2078**

Once connected, initial greeting *"Welcome to ….." Dictation System"* will play.

1. Enter your User ID followed by the **{#}** key.
2. Enter the Work type followed by the **{#}** key.
3. Enter the Patients Medical Record Number followed by the **{#}** key.
4. Press {**2**} to begin dictating.
5. Press {**9**} to complete the dictation and hang-up the telephone, OR Press {**5**} to begin a new dictation (begin at Step 2.)

See Telephone Keypad Instructions On Back

Telephone Keypad Controls

[1] = Play
[2] = Record / Pause (toggle key)
[3] = Rewind w/Playback (may press several times)
[4] = Pause
[5] = Start second dictation
[6] = Go to end of dictation
[7] = Continuous Forward
[8] = Go to beginning of dictation
[9] = Disconnect from system

Dictation Report Types

CHARLTON SITE

1. Consultation Note
2. Discharge Summary
3. Operative Report
4. Pre Anesthetic Clinic
5. Clinic (Fracture and Out-Patient)
6. Endoscopy
7. EDS (EVPs and EMGs)
13. Procedure Note
21. Maternal Quality of Care Committee

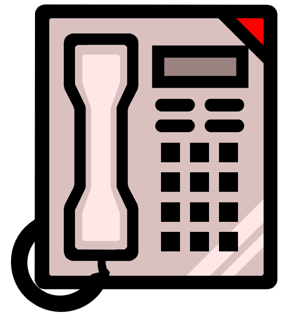
CMHS SITE

8. LOA
9. Psychological Testing
10. Social Work
11. Consultation Note
12. Discharge Summary

CAHS SITE

14. Procedure Note
15. Clinic Note

LISTENING TO DICTATED REPORTS AT ST JOSEPH'S HEALTHCARE



- Use telephone to listen to Diagnostic Imaging Reports that have been dictated but not yet transcribed
- Requires **Check-In #** of your Patient's Exam. Found in **Check-In # field** (usually beside Patient's Name) on any PACS Workstation
- If you are unable to find **Check-In # field** on the Workstation, then call Diagnostic Imaging staff for assistance: **x33606 or x36009**

Instructions

1. DIAL 32078 to access the central dictation system.

2. PRESS the # sign.
It is Important that you PRESS THE # SIGN to LISTEN, because 32078 is also used to DICTATE reports.

3. PRESS 1. Enter Physician Author Dictation ID Number (0995)

4. PRESS 1.

5. Enter Patient's 7-digit **Check-In #**

6. LISTEN to the report

- Press 5 to listen to a previous exam report on your patient, if the report you are hearing is not the one you requested
- If you have entered the wrong check-in number or if would like to hear another report, follow the verbal prompts, Press 1 then repeat Steps 5 & 6

PEDIATRIC HISTORY & PHYSICAL EXAMINATION

HISTORY

Identifying Data:

- Name, sex, age (years + months), race, who accompanies child, significant PMHx

Chief Complaint: in patient's or parent's words

History of Presenting Illness (HPI):

- Open-ended question, and allow parents or child to express their concerns
- Similar HPI details to an adult history
- Establish time line: "when was your child last well?", "what happened next?" etc
- Select key symptoms and expand:
    - colour, character, quantity of vomit etc,
    - OPQRST of pain, aggravating/relieving factors etc
- Always ask about recent exposures to ill contacts – family, school

Past Medical History (PMHx):

- Significant ongoing medical problems
- <u>Prenatal history</u>:
    - Mother's age, gravida, live births, abortions etc
    - Planned vs unplanned pregnancy, onset of prenatal care
    - Complications, smoking, drinking, meds, drug use in pregnancy
    - Gestational age at birth
- <u>Birth history</u>:
    - Spontaneous vs induced labour, duration, complications
    - Presentation: breech, vertex, transverse
    - Interventions required: forceps, vacuum, c-section
    - Resuscitation required, Apgars, birth weight (conversion chart)
    - NICU, Level 2 nursery admission, duration
- <u>Newborn history</u>:
    - Common problems: jaundice, poor feeding, difficulty breathing
- Hospitalizations and significant accidents

- Surgical history

Medications – including dose changes, compliance
Allergies – list specific reaction
∗ **Immunizations** – ask specifically about Prevnar, Menjugate, Varivax
PEDIATRIC HISTORY AND PHYSICAL EXAMINATION (Continued)

Feeding History (if relevant):
- Breast feeding: exclusively?, duration, frequency
- Formula: brand, how is it prepared/diluted, # of feedings/day, quantity
- Solids: when started, tolerated, any reactions
- Vitamins (especially iron and Vit D): which ones, how often, dose
- Present diet: cereals, fruit, vegs, eggs, meat, amt of cow's milk
- Any difficulties with feeding?

Developmental Milestones (if relevant)**:**
- Have you ever had any concerns about your child's development?
- How does child compare with siblings?
- Ask about current milestones in each category as appropriate for their age:
    - Gross motor
    - Fine motor, vision
    - Speech, hearing
    - Social skills
- Use major milestones (walking, first word, toilet training, etc) to assess previous development *(Reference on page 38)*
- Use Denver II charts etc to assess current stage of development

Social History
- Who lives at home? Who are primary caregivers? Parents work outside the home?
- Does the child attend daycare? How many other children? In a home vs. institution?
- Stability of support network: relationship stability, frequent moves, major events (death in family etc), financial problems, substance abuse in the home
- School adjustment, behaviour problems, habits (nail-biting, thumbsucking etc), sleep changes

- How has this disease affected your child/ your family?
- What does your family do for fun? What does your child do for fun?
- For an asthma history: smoke, pets, carpets, allergens in the home, family history of asthma / atopy.

PEDIATRIC HISTORY AND PHYSICAL EXAMINATION (Continued)

Family History:

- Are parents both alive and well? How many siblings? Are they healthy?
- Are there any childhood diseases in the family?
- Consanguinity – are mother and father related in any way?
- Relevant family history (3 generations) – autoimmune hx in Type I DM, atopic hx in asthma etc
- Draw pedigree if possible for genetic assessment

Review of Systems:

General: feeding, sleeping, growing, energy level
Signs of illness in kids: *activity, appetite, attitude (3 A's)*

HEENT: infections (how often, fever, duration): otitis, nasal discharge, colds, sore throats, coughs, nosebleeds, swollen glands, coughing or choking with feeding

Cardio:
Infants: fatigue/sweating during feedings, cyanosis, apneas/bradycardic episodes
Older kids: syncope, murmurs, palpitations, exercise intolerance

Resp: cough, wheezing, croup, snoring, respiratory infections

GI: appetite, weight gain (growth chart), nausea/vomiting, bowel habits, abdominal pains

GU: urinary: pain/frequency/urgency, sexually active, menarche/menses, discharge/pruritis/STDs

MSK: weakness, sensory changes, myalgias, arthralgias, ‘growing pains’

Neuro: headaches, seizures (febrile vs afebrile, onset, frequency, type), tics, staring spells, head trauma

Skin: rashes, petechiae, jaundice, infection, birthmarks

PHYSICAL EXAMINATION

General Inspection

- Sick vs not sick?
- Toxic appearance? listlessness, agitation, failure to recognize parents, inadequate circulation (cool extremities; weak, rapid pulse; poor capillary refill; cyanotic, gray, or mottled colour), respiratory distress, purpura
- Level of consciousness
- Nutritional status – well nourished?
- Developmental status (“pulling up to stand in crib”, “running around room”)
- Dysmorphic features – look specifically at face, ears, hands, feet, genetalia

Vital Signs:

- Include Temperature, Heart Rate, Respiratory Rate, Blood Pressure and O_2 saturation

NORMAL PEDIATRIC VITAL SIGNS

Age	HR	SBP	RR
Newborn (<1 wk)	120-160	60-70	30-60
Neonate (<1 mos)	120-160	75-90	30-60
Infant (<1 year)	110-140	75-120	20-40

Preschool (3-5yrs)	90-120	75-125	20-25
Child (6-12 yrs)	80-110	83-120	16-24
Adolescent (>12 y)	70-100	90-130	12-18
Adult (>18 yrs)	60-100	90-130	12-18

Anthropometrics (plot on growth curves at every visit!):
- Height (supine length to 2 years, then standing height)
- Weight
- Head circumference (generally birth to 2 years, >2 yrs if specific concerns)
- Plot BMI (kg/m^2) on updated CDC growth curves for appropriate BMI for age
- CDC Growth Curves available at: http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm

PEDIATRIC HISTORY AND PHYSICAL EXAMINATION (Continued)

Hydration Status
- Comment on mucous membranes, tears, skin turgor, sunken eyes, in addition to appropriateness of vital signs, etc
- For classification of mild, moderate, severe dehydration – see "Fluids & Electrolytes"

HEENT:
- Head: dysmorphic features, shape of skull, head circumference, fontanels in infants
- Eyes: strabismus, pupillary response, fundoscopy, red reflex in infants, conjunctivitis
- Ears & pharynx exam in any child with a fever!
- Nose: turbinates, deviation of septum, presence of polyps?
- Mouth: lips (lesions, colour), mucous membranes including gingiva, tongue, hard/soft palate,
- Dentition: presence of teeth, tooth decay
- Neck: lymphadenopathy, palpation of thyroid, webbing (Noonan, Turner syndrome), torticollis

Cardiovascular:
- HR, BP, apical beat, heaves/thrills
- S1/S2, extra heart sounds (S3, S4)
- Murmurs:
    - Timing (systole, diastole, continuous)
    - Location of maximal intensity, radiation
    - Pitch and quality (machinery, vibratory, etc),
    - Loudness (I – VI / VI)
- Perfusion:
    - Pulses – strength/quality, femoral pulses in all infants
    - Capillary refill time
    - Skin colour: pink, central/peripheral cyanosis, mottling, pallor

Respiratory:
- Audible stridor, sturtor, wheeze, snoring
- Position of child, ability to handle secretions
- RR, O_2 saturation (current FiO_2), level of distress
- Able to speak in full sentences (if age appropriate)
- Depth and rhythm of respiration
- Signs of distress: Nasal flaring, tracheal tug, indrawing

- Chest wall deformities: kyphosis, scoliosis, pectus excavatum/carinatum
- Finger clubbing

PEDIATRIC HISTORY AND PHYSICAL EXAMINATION (Continued)

Abdomen:

- For peritoneal signs: ask child to jump up and down or wiggle hips, to distend and retract abdomen “blow up your belly and then suck it in”
- Inspection: scaphoid/distended, umbilical hernias, diastasis recti
- Auscultation: presence of bowel sounds
- Percussion: ascites, liver span, Traube’s space for splenomegaly
- Palpation: hepatosplenomegaly?, tenderness, guarding (voluntary, involuntary), masses (particularly stool presence in LLQ)
- Stigmata of liver disease: jaundice, pruritis, bruising/bleeding, palmar erythema, caput medusa, telangiectasia, ascites, hepatosplenomegaly

Genito-urinary:

- Anal position, external inspection (digital rectal examination in kids ONLY with clinical indication), Tanner staging
- Male infants: both testes descended, hypospadias, inguinal hernias
- Females: labia majora/minora, vaginial discharge, erythema/excoriation of vulvo-vaginitis (NO speculum exam if pre-pubertal)

MSK:

- Gait assessment, flat feet vs toe walking vs normal foot arches
- Standing: genu valgum “knock knee” vs genu varum “bow legged”
- Joints: erythema, swelling, position, active/passive range of motion, strength, muscle symmetry
- Back: kyphosis, scoliosis

Neurological:

- Overall developmental assessment
    - Try playing ball with younger children, or even peek-a-boo!
- Level of consciousness (Glasgow Coma Scale if appropriate)
- Newborns: primitive reflexes, moving all limbs, presence of fisting?
- Cranial nerves: by observation in infants, formal testing in older children
- Motor: strength, tone, deep tendon reflexes, coordination
- Sensory: touch, temperature, position/vibration sense

- Cerebellar: gait (heel to toe, on heels, on toes, finger-to-nose, rapid alternating movements in older children, Romberg (eyes open then closed)

Derm:
- Jaundice, pallor, mottling, petechiae/purpura
- Rashes, birthmarks, hemangiomas, stigmata of neurocutaneous disorders

ADOLESCENT INTERVIEWING (HEADDSS)

- Interview teens alone with parents invited to join at the end
- Allow adequate, uninterrupted time to inquire about all aspects of their life, and high-risk behaviours in private setting
- Assure **confidentiality** at beginning of interview, and prior to discussing drug use and sexuality

Home

- Tell me what home is like…
- Who lives at home? How does everyone get along? What do you argue about?
- Family members – ages, occupations/education, health status, substance abuse

Education / Employment

- Name of school, grade level, attendance pattern
- Most favourite/least favourite courses, marks in each course, change in marks recently?
- Part-time / full-time job – for $ or 'experience'

Activities

- What do you do for fun? On weekends?
- Do you feel you have enough friends? Who are your best friends? What do you do together?
- Sports / Exercise, extra-curricular activities

Drugs

- Have you ever tried cigarettes? Alcohol? Marijuana?
- Ever drunk?
- For younger teens: ask about friends' use and peer pressure
- Cover all drug classes: hallucinogens, amphetamines, rave drugs, IV drugs, crack cocaine, OTC meds, anabolic steroids
- What age did you start? Frequency of use? How much?
- What do you like/dislike about X? Why do you use X ?
- Do you use alone? Any police involvement? Dealing?

Dieting

- Do you have concerns about your weight/shape?
- Have you tried to change your weight/shape in any way? (dieting/exercise)
- Presence of bingeing/purging behaviours, use of diuretics/laxatives
- Tell me what you eat/drink in an average day…
- *~20% of teens are on a diet at any one time, up to 66% have tried to lose weight in the past*
- *Use BMI curves to estimate 'healthy weight' for teen based on height*

Sexuality *Over 2/3 of teens have had one sexual partner by age 18*

- Are you interested in the same sex, opposite sex or both? (DO NOT assume heterosexuality!)
- Are you dating someone now? Are you having sex? What do you use for contraception/STI prevention (condoms, OCP, Depot, etc)
- Number of sexual partners /age of first sexual activity/STI history / last pelvic exam in females / ever tested for STIs, HIV?

Suicide / Depression

- Screen for depression (SIGECAPS)
- Have you lost interest in things you previously enjoyed?
- How would you describe your mood? On a scale of 1-10?
- Any change in sleep pattern? Ability to concentrate?
- Have you had any thoughts about hurting yourself?

Safety

- Do you regularly use: seatbelts? Bike helmets? Appropriate gear when snowboarding/skateboarding?
- Does anyone at home own a gun?
- Has anyone ever hurt you or touched you in a way that was hurtful or inappropriate

WEIGHT CONVERSION CHART

OUNCES

POUNDS

0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	28	57	85	113	142	170	198	227	255	284	312	340	369	397	425
1	454	482	510	539	567	595	624	652	680	709	737	765	794	822	851	879
2	907	936	964	992	1021	1049	1077	1106	1134	1162	1191	1219	1247	1276	1304	1332
3	1361	1399	1418	1446	1474	1503	1531	1559	1588	1616	1644	1673	1701	1729	1758	1786
4	1814	1843	1871	1899	1928	1956	1985	2013	2041	2070	2098	2126	2155	2183	2211	2240
5	2268	2296	2325	2353	2381	2410	2438	2466	2495	2523	2552	2580	2608	2637	2665	2693
6	2722	2750	2778	2807	2835	2863	2892	2920	2948	2977	3005	3033	3062	3090	3119	3147
7	3175	3204	3232	3260	3289	3317	3345	3374	3402	3430	3459	3487	3515	3544	3572	3600
8	3629	3657	3686	3714	3742	3771	3799	3827	3856	3884	3912	3941	3969	3997	4026	4054
9	4082	4111	4139	4167	4196	4224	4252	4281	4309	4338	4366	4394	4423	4451	4479	4508
10	4536	4564	4593	4621	4649	4678	4706	4734	4763	4791	4820	4848	4876	4905	4933	4961
11	4990	5018	5046	5075	5103	5131	5160	5188	5216	5245	5273	5301	5330	5358	5387	5415
12	5443	5472	5500	5528	5557	5585	5613	5642	5670	5698	5727	5755	5783	5812	5840	5868
13	5897	5925	5954	5982	6010	6039	6067	6095	6124	6152	6180	6209	6237	6265	6294	6322
14	6350	6379	6407	6435	6464	6492	6521	6549	6577	6606	6634	6662	6691	6719	6747	6776
15	6804	6832	6861	6889	6917	6946	6974	7002	7031	7059	7088	7116	7144	7173	7201	7229

ADMISSION ORDERS (ADDAVID)

Admit: Admit to (Ward 3B/3C/NICU/L2N) under *(staff name, Team #)*

Diagnosis: Confirmed or Suspected (eg. UTI with 2° dehydration)

Diet: *DAT* (diet as tolerated) *NPO* (nothing per os/by mouth; if going for surgery or procedures) *Sips Only*, *CF* (Clear Fluids), *FF* (Full Fluids), *Thickened Fluids* (dysphagia), *Advancing Diet* (NPO to sips to clear fluids to full fluids to DAT), *Diabetic Diet* (indicate Calories eg. 1800 Kcal, 2200 Kcal), *Cardiac Diet*, *TPN* etc. Include amount, frequency, rate if applicable.

Activity: *AAT* (Activity as Tolerated), *NWB* (Non-Weight bearing), *FWB* (Full Weight bearing), *BR* (Bed Rest), *BR with BRP* (Bed Rest with Bathroom Priviledges), *Ambulation* (Up in Chair Tid, Ambulate bid)

Vital Signs: *VSR* (Vital Signs Routine (HR, RR, BP, O2 sat, Temp. q 8-12 hours, q shift), *VS q4h* (if particularly sick patient requiring more frequent vitals), *Special parameters* (eg. Postural vitals, Neuro vitals)

Monitor: Accurate Ins & Outs (Surgery, volume status pts.)
Daily weights (eg. Renal failure, edematous, infants)

Investigations:

Hematology: CBC + diff, PTT/INR
Biochemistry: Electrolytes *(Na^+, K^+,Cl^-, HCO_3^-)*, Urea, Creatinine, Ca^{2+}, Mg^{2+}, PO_4^-, glucose, CSF cell count, CSF protein and glucose
Microbiology: Urine R&M/C&S, Blood Cultures, CSF from LP for gram stain, C&S. For this section just remember all the things you can culture: CSF, Sputum, Urine, Feces, Pus from wounds, Blood
Imaging: CXR, CT, MRI, EKG, PFT, Spirometry
Consults: Social Work, Neurology, Infectious Diseases

Drugs

All medications patient is already on (Past), medications the patient needs right now (Present), anticipate what the patient might need: prophylaxis, sleep, nausea and pain (Future)
10 Patient P's: Problems (specific medical issues), Pain (analgesia), Pus (antimicrobials), Puke (anti-emetics, prokinetics, antacids), Pee (IV fluids, diuretics, electrolytes), Poop (bowel routine), Pillow (sedation), PE (anticoagulation), Psych (DTs), Previous Meds

Ensure you date and time your orders, put the child's weight and list any allergies on the order sheet. Make sure you sign the order sheet and write your name legibly and pager number.

PROGRESS NOTE: PEDIATRICS

<u>**General Pediatrics Ward (3B/3C) – Clinical Clerk Progress Note**</u>

Date ∗ Always note the Date, Time, Your Name and Pager Number ∗
Time

ID: age, sex with a history of (non-active/chronic issues/previously well) admitted with (list active/acute issues for why patient is admitted)
eg. *18 mo ♀ previously healthy, admitted with a UTI and 2° dehydration*

Subjective:

S: How patient's night was (O/N) and how they feel that day and any new concerns they have. What has changed since the previous note. Does the patient have any new symptoms? How is the patient coping with the active symtpoms, progression, better/worse. If patient is non-verbal, ask the parents or patient's nurse. Remember to ask about: behaviour, activity, sleep, appetite, in and outs.

Objective:

O: **General:** Patient disposition (irritable, sleeping, alert), general appearance, behaviour, cognition, cooperation, disposition
Vitals: HR, BP, RR, SaO_2 (on Room Air/NP with rate or %), Temp (PO/PR/AX), weight (daily, with changes noted), Inputs (Diet, IV fluids and rate), Output (Urine Output, BM/Diarrhea, Vomiting, Drains)
Vitals: Temp (PO or PR or Axilla?), HR, RR, BP, SaO2 (on room air? 24%? 2L?)
Focused P/E of system involved plus CVS, RESP, ABDO, EXT/MSK common for hospitalized patients to develop problems in these systems
Investigations (Ix): New lab results, imaging or diagnostic tests/interventions
MEDS: reviewed daily for changes regarding those that are new/hold/discontinued/restarted

Assessment & Plan\Impression (A/P or Imp):

Summarize what the new findings mean, what progress is being made Improved? Stable? Waiting investigations/consult? Differential Diagnosis if anything has been ruled in/out

Plan (A/P or I/P):

Issue (1) → eg. UTI → Day 2 of Empiric Abx, likely 14 day course required. Awaiting culture and sensitivity
Issue (2) → eg. Dehydration → Intake still minimal, Urea mildly elevated, clinically dehydrated therefore continue IVF at 50 ml/hr
Encourage oral fluids

Name, Designation (CC\PGY), Pager Number

Discussed with Dr. ________________

<u>Documentation</u>

- **Colleges and legislation define good documentation**
- **Essential part of being a competent physician**
- **Provides communication amongst team members and other physicians**

- **Information documented in chart belongs to the patient - - you are the caretaker**
- **ALL notes in medical records should be written with expectation that they <u>will be</u> viewed by the patient and/or their legal representative**

<u>PROFESSIONALISM</u>

- **Colleges require a written, <u>legible</u>, medical record accompany patient encounters, as a standard of practice**
- **Hospitals require documentation be done in a timely manner**
- **Documentation should provide a clear indication of physician's thought process**

<u>Documentation in clinical notes should</u>:

- **Be <u>factual</u>, objective, and appropriate to the purpose**
- **Be dated and timed (preferably with 2400 clock)**
- **Provide chronological information**
- **Be written in a timely manner**
- **Be legible, including signature and training level**
- **Use only well-recognized abbreviations**

<u>Documentation should allow someone to determine</u>:

- **Who attended the appointment (i.e. mother, father)**
- **What happened**
- **To whom**
- **By whom**
- **When**
- **Why**
- **Result**
- **Impression**
- **Plan**
- **Late entries must be recorded as such**
- **Phone contact should also be timed**

Choose words carefully – use:

'Reported no…..'	**VS**	**'denied'**
'Declined'	**VS**	**'refused'**

Avoid <u>subjective</u> and/or disparaging comments relating to the care provided by other HCP.

Doubts about a colleague's treatment decisions should not be recorded in medical records. Better to talk to your colleague instead.

Write only what YOU did or did not do. You cannot testify to the truth of the event if no personal knowledge.

- **If negative event occurs, document what steps you took (who notified, course of action). Again write no comments as to what others did, will do, or said, etc. Notes may be written elsewhere (not in chart) in the event of potential litigation, but these notes are not protected,**

NEVER change, tamper or add to a medical record. Any subsequent additions or changes should be dated and signed at the time you make them, to avoid undermining the credibility of any changes.

- **Do NOT later change an existing entry.**
- **Do NOT black-out or white-out words or areas.**
- **Do NOT insert entries between lines or along the margins of the chart as these may appear to have been added later, casting doubt on their reliability.**
- **Do NOT add an addendum to the chart after learning of a legal action, threat of a legal action or other patient complaint.**

Poor charting may be perceived as reflecting less attention to detail, risking the conclusion that care provided was poor.

DISCHARGE SUMMARY TEMPLATE: PEDIATRICS
Today's date
My name, designation (i.e. resident, clinical clerk)
Attending MD
Patient name, ID#
Copies of this report to: FD, pediatrician, pertinent consultants
Date of Admission:
Date of Discharge:
"Start of dictation"

DISCHARGE DIAGNOSIS:
1., 2. etc

OTHER (non-active) DIAGNOSIS:

FOLLOW-UP: (appointments, pending investigations, home care)

DISCHARGE MEDICATIONS: (dose, frequency, route and duration)

SUMMARY OF PRESENTING ILLNESS:
- 1-2 line summary of child's presenting illness and reason for admission. Refer to separately dictated note for full history and physical examination of admission.
- Only if no admission dictation completed, indicate full history of presenting illness (HPI), Past medical history, and initial physical examination prior to 'Course in Hospital'

COURSE IN HOSPITAL:
- Describe briefly the events and progression of illness while in hospital including status upon discharge
- If the child has multiple medical issues, this section can be done by system (cardiovascular, respiratory, fluids and nutrition, ID, hematological, CNS, etc)
- List complex investigations (with results) under a separate heading.

State your name, designation; Attending MD name Press 8 to end dictation, and write down job # on face-sheet of chart

Hamilton Health Sciences

QUALITY DOCUMENTATION INITIATIVE

Discharge Summary Template

Diagnosis on Admission: Includes most responsible diagnosis for hospital admission

Diagnosis at Discharge: Includes most responsible diagnosis for hospital admission
as well as co-morbid conditions identified either at time of admission
or during the hospital admission as well as complications developed during course in hospital

Procedures: Includes a comprehensive list of procedures performed during hospital admission for definitive treatment, diagnostic or exploratory purposes

Course in Hospital: Includes a detailed comprehensive list of critical events while in hospital, complications, response to treatment

Discharge Medications: Includes a comprehensive list of medications, active at discharge, dosage and mode of administration

Discharge Plans/ Follow-up: Includes a comprehensive list of appointments, treatments, referrals, recommendations and follow-up including responsible physician(s), health care team(s),
or agency involved, including arrangements for aftercare

IT'S THE WRITE THING TO DO

Discharge Summaries for all Patients

FLUID MANAGEMENT IN CHILDREN

3 Components to Fluid Management:

1. Maintenance
2. Deficit Replacement
3. Ongoing Losses Replacement

1. Maintenance

- Fluid and electrolyte requirements are directly related to metabolic rate
- *Holliday-Segar Rule* - calculation of maintenance fluid requirements using body weight for resting hospitalized patients (based on 100 cc for each 100 kcal expended):

Body Weight	**Volume in 24 hours**
Up to 10 kg	100 cc/kg/d (1,000 cc for 10kg child/day)
11- 20 kg	1,000 + 50 cc/kg above 10 kg
Above 20 kg	1,500 + 20 cc/kg above 20 kg
Weight (kg)	Hourly Fluid Requirements (Calculated by "4-2-1 rule")
0-10 kg	4 mL/kg/h
11-20 kg	40 mL/h + (2 mL/kg/h for each kg over 10 kg)
>20 kg	60 mL/h + (1 mL/kg/h for each kg over 20 kg)

- Insensible water losses = cutaneous + pulmonary water losses which are calculated as ~ 300 – 500 cc/m^2
- During fluid management, we should assess factors affecting insensible and/or urinary fluid losses
- Normal Na+ and K+ requirements 2 – 4 mEq/kg/day
- During fluid management, we should assess factors that affect Na and K balance
- Adding 5% dextrose to maintenance solution prevents protein catabolism
- Most commonly used solution in children:
  D5 ½ NS + 20 mEq/L KCl or D5W/NS + 20 mEq/L KCl
- D5 ½ NS + 20 mEq/L KCl = 4 mEq/100cc/d Na+ and 2 mEq/100cc/d K+
    - D10W: use in Neonates and Hypoglycemia

2. Deficit Replacement – Assessment Includes:

Severity:

- Represents the percentage of body weight loss, acute weight loss reflects losses of fluid and electrolytes rather than lean body mass
- Most commonly estimated based on history and physical exam
- See table on next page
- To calculate fluid deficit: % x 10 x body weight (pre-illness)

Type:

- A reflection of relative net losses of water and electrolytes based on serum Na+ or osmolality
- Important for pathophysiology, therapy and prognosis
- Affects water transport between ICC and ECC
- 70 – 80% pediatric dehydration is isotonic

Type of Dehydration	Electrolyte Status	Clinical Features
Hypotonic or Hyponatremic	Serum Na+ < 130 mEq/L, Serum Osm < 270	Exacerbated signs of dehydration Risk of seizure
Isotonic or Isonatremic	Serum Na+=130-150 mEq/L, Serum Osm 270 – 300	
Hypertonic or Hypernatremic	Serum Na+ > 150 mEq/L, Serum Osm >300	Decreased signs of dehydration Irritable, increased tone and reflexes

FLUID MANAGEMENT IN CHILDREN (Continued)

Assessing Dehydration: Severity

Patient Presentation	Mild	Moderate	Severe
Age % Weight Loss	Less than 1 year: Less than/equal to 5% Greater than 1 year: <= 3%	Less than 1 year: 10% Greater than 1 year: 6%	Less than 1 year: 15% Greater than 1 year: 9%
Heart Rate Blood Pressure	Normal Normal	Mild tachycardia Normal (orthostasis)	Moderate tachycardia Decreased
Respiratory Rate	Normal	Normal	Increased
Skin Capillary refill Elasticity (less than 2 years) Anterior fontanel Mucous membranes	 < 2 seconds Normal Normal Normal / Dry	 2 - 3 seconds Decreased Depressed Dry	 > 3 seconds Tenting Depressed Dry
CNS Mental Status	Normal	Altered	Depressed
Eyes Tearing Appearance	 Normal / Absent Normal	 Absent Sunken	 Absent Sunken
Laboratory Tests **Urine** Volume Specific gravity **Blood** Blood Urea Nitrogen	 Small 1.020 Upper normal	 Oliguria 1.025 Elevated	 Oliguria-anuria Maximal High
Signs of dehydration may be less evident or appear later in hypernatremic dehydration; conversely, they may be more pronounced or appear sooner in hyponatremic dehydration			

FLUID MANAGEMENT IN CHILDREN (Continued)

Labs:

- Helpful in evaluation of **Type** and **Severity** of dehydration
- May need to start therapy before lab results available
- CBC for hemoconcentration, infection, source of dehydration
- Electrolytes (Na^+, K^+, Cl^-, HCO_3^-)
- BUN, Cr increased in severe dehydration
- Blood gas and HCO_3^- for metabolic acidosis, may need to calculate Anion Gap (AG) = $[(Na^+ + K^+) – (Cl^- - HCO_3^-)]$
  Normal AG = 12 ± 4
- Urine R&M, concentrated urine in dehydration, infection

Monitoring Ongoing Dehydration\Rehydration Response:

- Clinical response to treatment
- HR, BP, Cap refill, LOC, Urine output
- As indicated: cardioresp monitor, CVP, ECG
- Labs as indicated: electrolytes, urine specific gravity, serum / urine Osm
- Repeated careful weight measurement
- Accurate INS and OUTS including stool volume & consistency

2. Deficit Replacement – Oral Rehydration Therapy (ORT):

- First-line treatment for Mild to Moderate dehydration
- Requires close monitoring and compliance of patient and parents
- Contains balanced amounts of sodium and glucose
- Basic treatment is replacing the deficit over 4 – 6 hours and replacing ongoing losses (eg. Diarrhea) by ORT
- Initial rates of ORT:
  - Mild:1 cc/kg/5 mins
  - Moderate 2cc/kg/5 mins

Solution	**Glucose (mEq/L)**	**Na (mEq/L)**	**K (mEq/L)**	**Base (mEq/L)**	**Osmolality**
WHO	111	90	20	30	310
Rehydrate	140	75	20	30	310
Pedialyte	*140*	*45*	*20*	*30*	*250*
Pediatric Electrolyte	140	45	20	30	250
Infantlyte	70	50	25	30	200
Naturlyte	140	45	21	48	265

FLUID MANAGEMENT IN CHILDREN (Continued)

2. Deficit Replacement – Parenteral Therapy (IV):

- Indications: Severe dehydration, patients who fail ORT due to: vomiting, refusal or difficulty keeping up with losses
- Preferable site is IV, if unable to start IV use IO
- Consists of 3 phases:

(i) Initial Therapy

- Goal: expand ECF volume to prevent or treat shock
- Solution: isotonic saline (0.9% NS or RL) in all forms of dehydration, never use hypotonic solution!!!
- Bolus 10 – 20 cc/kg of N/S (or RL) over 15-20 mins initially, may be repeated until patient is hemodynamically stable, if unstable, call Peds 1000!
- Rapid Rehydration (eg. 20-40 cc/kg bolus + ORT) → no evidence
- If hypokalemic: start K^+ when patient voids (normal renal function). Note: no K^+ in bolus!

(ii) Subsequent Therapy

- Goal: continue replacement of existing deficit, provide maintenance and electrolytes, replace ongoing losses
- Solution: D5 ½ NS + 20 mEq/L KCL or D5NS + 20 mEq/L KCL in isotonic dehydration
- Deficit Replacement Time: usually over 24 hours → ½ deficit in first 8 hours, second ½ deficit over next 16 hours
- Subtract boluses from deficit calculation
- Source of Electrolyte Losses: 60% ECF and 40% ICF
  - For every 100 cc water lost, electrolyte losses:
    - Na^+: 8.4 mEq/L / 100cc
    - K^+: 6.0 mEq/L / 100cc
    - Cl^-: 6.0 mEq/L / 100cc

(iii) Final Therapy

- Return patient to normal status and to normal feeding

3. Ongoing Losses

Replace…	With…
Gastric Losses (Vx)	½ NS + 10 – 20 mEq/L KCl
Stool or Intestinal losses (Diarrhea)	Add HCO_3^- to ½ NS + 10 – 20 mEq/L KCl
CSF losses	0.9% NS
Urine Output	As indicated
Losses due to Burns	Increase fluid administration (Parkland)

Isotonic Dehydration

- See previous steps
- Rehydrate over 24 hours

Hypotonic Dehydration

- Degree of dehydration may be overestimated
- May need immediate circulatory support
- Calculate fluid losses as above
- Calculate electrolyte losses
- Calculate Na^+ to correct Na^+ to 130 mEq/L using the following formula (as long as Na^+ > 120 mEq/L)
    - (Desired Na^+ – Measured Na^+) x 0.6 x weight (kg)
- Replace losses over 24 hours (if acute losses!)
- Max increase 1 mEq/L

Hypertonic Dehydration

- Bolus by NS or RL as indicated
- Avoid electrolyte free solutions
- Calculate water and electrolyte losses
- Replace deficit slowly over 48 hours
- Monitor serum Na^+ q2 – 4hours (should not fall > 0.5 mEq/L/h, max 10 mEq/L/24h) and change fluids according to Na^+ drop
- Usually seize as Na^+ drops, rather than as increases
- If seizures or signs of increased ICP, treat with mannitol

Comparison of IV Solutions

IV Solution	Na^+ (mEq/L)	K^+ (mEq/L)	Cl^- (mEq/L)	Dextrose (g/L)	Osmolarity (mOsm/L)
Sodium Chloride 0.45%	77			0	154
Sodium Chloride 0.9% (0.9 NaCl, NS)	154		154	0	308
Sodium Chloride 3%	513			0	1030
Dextrose 5%	0			50	250
Dextrose 5% Sodium Chloride 0.2%* (D5 0.2NS)	39			50	320
Dextrose 5% Sodium Chloride 0.45% (D5 ½NS)	77		77	50	405
Dextrose 5 % Sodium Chloride 0.9%	154			50	560
Dextrose 10%	0			100	505
Dextrose 10% Sodium Chloride 0.2%*	39			100	575
Dextrose 10% Sodium Chloride 0.45%*	77			100	660
Dextrose 10% Sodium Chloride 0.9%*	154			100	813
Dextrose 3.3% Sodium Chloride 0.3% (⅔ * ⅓)	51		51	33.3	273
Lactated Ringers†	130	4	109	0	273

†Also contains Calcium (Ca^{2+}) 1.5 mmol/L, and Lactate (HCO_3^-) 28 mmol/L
*These solutions are not commercially available
Commonly used solutions are highlighted

Guidelines for Prescribing Maintenance IV Fluids in Children

- These are general guidelines for ordering maintenance IV fluids (IVF) only, and do not apply to resuscitation or complicated fluid and electrolyte disorders. ***Seek additional advise/appropriate consultation in the event of fluid and electrolyte abnormalities.***
- Consider IV fluids as DRUGS - individualize prescriptions *daily* according to objectives, and monitor for potential side effects.
- Be aware that the commonest side effect of IVF therapy is HYPONATREMIA, particularly in patients at risk, and if hypotonic solutions are used

Step 1:

Determine IV fluid rate, according to "maintenance fluid" requirements, and replacement of deficit or ongoing losses (Total Fluid intake (TFI). In general maintenance fluid rate is calculated by the "4:2:1" guideline, but should be individualized according to the clinical condition and patient assessment

Weight (kg)	ml/hour
0-10	4/kg/hour
11-20	40 + (2/kg/hr)
>20	60 + (1/kg/hr)

Step 2: The choice of fluid is dependent the individual patient.

Consider **ISOTONIC** IVF for the following patients:

- CNS disorder, Diabetic ketoacidosis
- Patients at risk of hyponatremia: acute infection, post-operative patients and burns, Plasma Na < 138

Add K^+ to provide 1-2 mEq/kg/day, if patient has urine output

Add Dextrose to prevent hypoglycemia/ketosis (exceptions: hyperglycemia,brain injury)

Consider **HYPOTONIC** IVF for the following patients:

- Patients with an EFW deficit - e.g. hypernatremia, ongoing EFW losses (renal, GI, skin)
- Patients with established 3rd space overload - e.g CHF, nephrotic syndrome, oliguric renal failure, liver failure
- Limited renal solute handling indicated - e.g. neonatal population, hypertension

	IV solution	Na (mEq/L)	K (mEq/L)	Cl (mEq/L)	% Electrolyte Free Water (EFW)*
Hypotonic	0.2% NaCl in D5W	34	0	34	78
Hypotonic	0.45% NaCl in D5W	77	0	77	50
Hypotonic	Lactated Ringers	130	4	109	16
	0.9% NaCl in D5W (ISOTONIC)	154	0	154	0

*Based on a sodium plus potassium concentration in the aqueous phase of plasma of 154mEq/L, assuming that plasma is 93% water with a plasma sodium of 140 mEq/L and a potassium concentration of 4 mEq/L

Step 3: MONITORING while on IV fluid	Measure and record as accurately as possible	
Clinical status: hydration status,urine output, ongoing losses, pain, vomiting, peripheral edema, and general well-being. **Daily weights** ***Reassess TFI, indications for and fluid prescription at least every 12 hours.*** Version date : April 2011	**Fluid balance:** must be assessed at least every 12 hours Intake: All IV *and* oral intake (including medication). Ensure this matches desired TFI. Output: all losses (urine, vomiting, diarrhea etc.)	**Labs:** Serum Electrolytes - at least daily if primary source of intake remains IV, or more frequently depending on clinical course, or in the presence of documented electrolyte abnormality. Urine osmolarity/sodium and plasma osmolarity as indicated, for determining etiology of hyponatraemia.

Developmental Milestones

	Gross Motor	Fine Motor	Language	Social & Self help	Red Flags
0-1 month	-Moves head from side to side on stomach -Usually flexed posture (prone position legs are under abdomen)	-Keeps hands in tight fists -Brings hands within range of eyes and mouth	-Turns toward familiar sounds & voices -Recognizes some sounds	-Recognizes the scent of his own mother's breast milk -Prefers the human face to all other patterns	- Sucks poorly - Doesn't respond to bright lights or loud noise blink when shown bright light - Seems stiff or floppy
Achieved					
2 months	-Hips not as flexed (prone position legs not under abdomen) -Head control improving (pull to sit)	-Hands open most of the time	-Cooing (vowel-like sound- ooooh, ah) -Increases vocalization when spoken to	-Smiles -Face is expressive	- Doesn't smile at the sound of your voice by 2 months - Doesn't notice her hands by 2 months -Not tracking objects
Achieved					
3 months	-Lift head when held -Lift head & chest when on tummy	-Grasps and shakes hand toys -Holds hands open	-Chuckles -Begins to imitate some sounds	-Turn toward the sound of a human voice -Smile when smiled at	- Doesn't hold objects - Doesn’t smile - Doesn’t support head
Achieved					
4 months	-No head lag in pull to sit -Rolls from front to back	-Reaching & grasping -Brings toys to mouth -Looks at objects in hand	-Shows excitement w/ voice & breathing -Increases vocalization to toys & people	-Smiles at self in mirror -Increases vocalization to toys & people	- Doesn't reach for and grasp toys by 3 - 4 months - Doesn't babble - Always crosses eyes
Achieved					
5 months	-No head lag -Head steady when sitting -May roll back→front	-Holds two objects in both hands when placed simultaneously	-Mimics sounds & gestures -2 syllable sounds (ah-goo)	-Babbles to get your attention -Able to let you know if he’s happy or sad	-Doesn’t roll over -Doesn’t lift head while on tummy
Achieved					
6 months	-Sits w/ hands on legs (propping self up) -Bears full weight on legs if held standing	-Transfers object from 1 hand to the other -Reaches after dropped toys	-Expresses displeasure with non-crying sounds	-Knows family from strangers -Pats at mirror image -Pushes adult hand away	-Babe makes no sounds or fewer sounds, especially in response to you -Doesn’t reach for things
Achieved					
7 months	-Bounces when held standing -Assumes crawling position	-Reaches with one hand -Bangs toys on table surface	-Begins responding to "no" -Starts using consonants (da, ba, ga)	-Enjoys social play -Interested in mirror images	-Reaches with 1 hand only -One or both eyes consistently turn in or out -Refuses to cuddle
Achieved					
8 months	-In sitting, reaches forward and can return to sitting up erect	-Holds own bottle -Starts eating finger foods	-Responds to own name -Babbles chains of consonants	-Plays peek-a-boo -Anticipates being picked up by raising arms	-Seems very stiff with tight muscles -Not babbling by 8 months
Achieved					
9 months	-Gets to sitting position alone -Pulls to stand	-Immature pincer grasp (thumb onto side of index finger)	-Uses “mama” or “dada” nonspecifically	-Waves bye	-Can’t push up on arms while on tummy -Can’t sit alone -Can’t bear weight in

	-Crawling			-Plays peek-a-boo	standing position
Achieved					
10 months	-Pulls to stand -Cruises with 2 hands on a rail or furniture (for support)	-Grasps bell by handle -Points at a bead/small object	- Jargons with inflection - Performs 1 nursery gesture on verbal command	Imitates nursery gestures: -Pat-a-cake -Waving -"So big"	-No special relationship w/ any family members -Isn't moving around room in some fashion i.e. rolling, creeping
Achieved					
11 months	-Stands momentarily -Walks with one hand held	-Mature pincer → can pick up tiny objects with ends of thumb and index finger	-One word with meaning (e.g. "dada") -Understands simple request with gesture	-Extends arm & leg to help when being dressed	-No stranger anxiety -Doesn't seek social interaction with familiar people
Achieved					
12 months	-Walks a few steps -Stands independently -Creeps upstairs	-Mature pincer grasp -Starting to point -Helps turn pages in a book	-2-3 words w/ meaning -Uses exclamations such as "Oh-oh!"	-Cries when mother or father leaves -Repeats sounds or gestures for attention	-Doesn't know their name -Not crawling or moving forward Says no single words
Achieved					

Developmental Milestones: 1 - 5 Years:

Skill	12 mo	15 mo	18 mo	2 yrs	3 yrs	4 yrs	5 yrs
Walking	Walking few steps, wide based gait, clumsy	Walking few steps, wide based gait, clumsy	Running, unstable Fall if trying to pivot	Running well Jumps with 2 feet on floor	Broad jumps Stands on 1 foot for 2 seconds	Walks on tip toes Tandem gait forward	Skips alternating feet Hops on 1 foot
Age Achieved							
Stairs	Creeps up-stairs	Creeps up-stairs Crawls down-stairs very slow & careful	Walk up-stairs w/ hand held 2 feet per step	Walks up stairs alone 2 feet per step	Alternates feet while walking up stairs	Alternates feet while walking down stairs Jumps off last steps	Balances on 1 foot for > or equal to 10 seconds
Age Achieved							
Gross Motor	Stands well Climbs up onto a chair	Climbs up on a chair Throws ball +/- falling over	Sit on chair Walks & pulls object	Kicks ball Throws ball overhand	Pedals tricycle	Stands on 1 foot for 4 seconds	Bicycle +/- training wheels
Age Achieved							
Fine Motor	Pincer grasp Releases object if asked	Stacks 2 blocks	Stacks 3-4 blocks Puts shapes on to board	Stacks 5-7 blocks	Stacks 9 blocks Imitates bridge	Stacks 10 blocks Opposes fingers to thumb in sequence	Does buttons up
Age Achieved							
Drawing	Crayon in mouth	Linear scribbles	Circular	Imitates stroke	Copies Circle *3yrs* Copies cross	Copies square	Copies triangle

	Marks paper		Scribble		*3.5yrs*		Prints name
Age Achieved							
Expressive Speech	2-3 words	5-10 words	20 - 50 words	100-200 words 2 - 3word combo	5-8 words together Uses: **I, me, u** (pronouns) Answers 'W' questions	Past tense Prepositions (**behind, on, under**) Tells stories	Defines words by use- what is a ball?
Age Achieved							
Receptive Speech	1 command w/ gestures	1 command w/ out gestures	5 body parts 5 Common objects	2 step command	Knows Age Knows their Sex Full name	5-10 numbers by rote 3-4 step instruction	Counts 10 pennies Follows group direction
Age Achieved							
Eating	Eats cheerios	Sipping cup	Spoon level, w/ solids	Spoon level, w/ semi-solids	Eats neatly	Eats neatly	Spreads peanut butter on bread
Age Achieved							
Dressing	Plays peek-a-boo	Helps to remove cloths	Start taking off cloths	Takes cloths all off Raise arms	Supervised dressing;	Dress alone Unbuttons clothes	Buttons clothes up
Age Achieved							
Cognitive/ Adaptive	Kisses on request Should have object permanence	Seeks help w/ gestures	Use cause and effect toys 	Parallel play Folds paper Unscrews tops	Plays simple games Listens to stories Group play	Imaginary friend 4 colours Knows: same, biggest, tallest	Knows alphabet Sort by size Label shapes, classify object

IMMUNIZATIONS

Routine Publicly Funded Immunizations for Children in Ontario

Age at Vaccination	DPTP	HiB	PneuC 13	MMR	MenC-C (Menjugate)	VZ	Hep B
2 months	**X**	**X**	**X**				
4 months	**X**	**X**	**X**				
6 months	**X**	**X**	**X**				
12 months				**X**	**X**		
15 months			**X**			**X**	
18 months	**X**	**X**		**X**			
4-6 years	**X**			**Or X**			
12 years							**X (2)**
14-16 yrs	**dTap**				**X (if not yet given)**		

DPTP = **D**iptheria toxoid, acellular **P**ertussis, **T**etanus toxoid, inactivated **P**olio vaccine;
dTap = **T**etanus toxoid with reduced **d**iphtheria toxoid and **a**cellular **p**ertussis components (adolescent/adult type)
HiB = **H**aemophilus **I**nfluenza **B**
MMR = Measles, **M**umps, **R**ubella
PneuC 13 = **Pneu**mococcal **C**onjugate 13 valent vaccine
VZ = **V**aricella **Z**oster
MenC-C = **Men**ingococcal **C C**onjugate vaccine; at 14-16 years can give Conjugate or Quadrivalent A,C,Y,W135
Hep B = **Hep**atitis **B**, 2-dose schedule in Grade 7; if mother is HbsAg +ve, give HBIg and Hep B vaccine at birth, 1 month, 6 months;
Other Vaccines : Hepatitis A (Havrix, Twinrix = combo with Hep B) = 2 vaccines 4-6 months apart for pre-exposure prophylaxis

Note: For premature infants, administer vaccines according to chronological or cumulative age, not corrected age

NEONATOLOGY

St Joe's NICU common terms and definitions list

A's and B's- (apnea and bradycardia) defined as a cessation of breathing >20 sec or pause in breathing associated with decrease in oxygen saturation <85% or HR <100 or change in color or tone. Or just the presence of bradycardia.
Will be reported as self resolved or requiring stimulation.
Common in preterm infants however must always rule out sepsis.

B/R- Breast feeding.

BLES- Bovine surfactant, medication give for treatment of RDS (Respiratory distress syndrome) given via ETT (endotracheal tube) dose 5cc/kg. May also be used in MAS (meconium aspiration syndrome) or severe pneumonia.

CPAP- Continuous positive airway pressure, non invasive form of ventilation providing continuous PEEP (positive end expiratory pressure) used to keep airways open and prevent airway collapse. Used in a multitude of settings.

CLD (chronic lung disease) - formerly known as BPD (bronco pulmonary dysplasia) - CLD is usually defined as oxygen dependency at 36 weeks' postmenstrual age (PMA) or 28 days' postnatal age (PNA), in conjunction with persistent clinical respiratory symptoms and compatible abnormalities on chest radiographs .

Gavage- form of feeding, by where an OG tube is inserted into the stomach (placed clinically) and a feed is given by gravity or over a period of time by pump. Prior to the feed the nurse will generally draw back to see if there is any residual feed in the stomach. Reported as 0/37, scant/37 or 5/37 where the first number represents the volume of the residual and the second number the volume of the feed given. Colour of the residual is important especially when evaluating for NEC (necrotizing enterocoloitis)

GBS – (group B streptococcus) organism that is a common cause of neonatal infection, all women should be screened at 35-37 weeks and important to note at deliveries or on evaluation of infants < 7 days of age.

Histogram- continuous monitoring of oxygen saturations over 1-2 hrs, done in either prone or supine position. Reported as an average of the time period.
Reported as greater than 90 over 90, first number represents the saturation the second the percentage of the time that they over that saturation.
Normal for preterm's 90 over 90
For preterm's greater than 30 days and diagnosed with CLD 85 over 90.
*Normal values may vary with new research.

IDDM- infant of a diabetic mother can cause a multitude of neonatal complications, most commonly hypoglycemia.

I/T ratio- immature to total ratio, used in the evaluation of sepsis. Calculated by taking the total number of immature WBC's (seen on manual differential) which includes, band, myelocytes,metomyleocytes, promyelocytes divided by the total number of neutrophils plus the immature WBC's.
Immature WBC's/total neutrophils + immature WBC's

IUGR (intrauterine growth restriction) - defined as symmetric or asymmetric, if symmetric both head circumference and weight are less than the 3rd percentile if asymmetric only the weight is <3rd percentile.

NEC (necrotizing enterocolitis) - Gut infection, characterized by feeding intolerance, bilious residuals, abdominal distension, bloody stools, with other signs and symptoms of sepsis.

Nippling- synonymous with bottle feeding, reported as infant nippled 20 (infant took 20cc by bottle)

RDS- (Respiratory Distress syndrome) common in preterm infants or infants of IDDM (infant of a diabetic mother) due to surfactant deficiency.

TPN- (Total Parenteral Nutrition)- form of nutrition given by IV, contains glucose and varying amount of Na^+, K^+, Ca^{2+} PO_4^{3-} , lipids and amino acids, generally used when infants cannot tolerate feeds.

TFI- (Total fluid index) volume of fluid that an infant receives per day, either enteral or parenteral. Reported in cc/kg/day. i.e. TFI of 60 cc/kg/day in a 3.0 kg term infant is:

60 x 3/24= 10 cc/hr or 30 cc q3h

Some useful definitions and normal values for term newborns:

Neonate: less than or equal to 28 days
Infant: 28 days to 1 year
Child: >1 year

Birth
-Average birth weight: 3.5 kg
-Average birth length: 50 cm
-Average birth head circumference: 35 cm

Weight loss
-Average weight loss in first week is 5-10% of birth weight
-Max weight loss in first 48 hrs: 7%
-Max weight loss in first week: 10%

Growth
-Return to birth weight by 14 days
-Infants double their birth weight by 5-6 months
-Infants triple their birth weight by 12 months
-Head circumference increases by 12 cm in first year of life

PROGRESS NOTE: NEONATES (LEVEL 2 NURSERY)

Date **Time**

ID: *Baby boy <u>(surname)</u>*
Born at $33^{5/7}$ (i.e. 33 weeks and 5 days) gestational age
Day of life (DOL): 12
Corrected Gestational Age: 36^{3} wks (33^{5}+ 12 days)
Birth weight: 2680g
Today's weight: 2550g (↑ 10 g from yesterday)

Brief problem list
e.g. 1. Prematurity
2. Apnea of prematurity
3. Unconjugated hyperbilirubinemia
4. Suspected NEC

S/O: Feeds: frequency, amount, what? (EBM? Formula? Supplement?), method, regurgitation/vomiting, breast feeding?
Stool/urine pattern
Other signs/symptoms you may be following (e.g. bilirubin)
Behaviour: Settles easily? Irritable? Jittery? Interaction? Sleep? Handling?
Episodes of Apnea/Bradycardia? (A's and B's)
IV fluid/rate, urine output
Medications and other treatments (i.e. phototherapy)
Recent labs and investigations.

A: Summarize active issues. Stable? Awaiting further investigations/consult
Differential Diagnosis

P: Outline plan by issue: include investigations, treatment, discharge plans
.
eg. Resolving NEC → increase feeds slowly, starting at EBM 5cc q3h
Jaundice → double phototherapy, recheck bili in am.

Name, Designation (CC\PGY), Pager Number
Discussed with Dr. ________________

NICU / L2N DISCHARGE SUMMARY TEMPLATE

Name of person dictating:
Patient Name:
Patient Identification Number:
Admission /Transfer to L2N Date:
Discharge Date:
Copies to: Family physician
Referral physician
Follow-up pediatrician
Health records
All health care professionals involved

Problems on Admission:	**Current Problems:**
1.	1.
2.	2.
3.	3.

Birth Parameters	**Discharge Parameters**
Gestational age:	Corrected and chronological age:
Weight:____ g (%ile)	Weight:____g
Length: _____ cm (%tile)	
Head circumference:____cm (%ile)	Head circumference:_____cm

Maternal History and Delivery:

____________was born at McMaster University Medical Centre/elsewhere on *(date*) at ___ weeks gestational age to *(parents' full names)*. *(Mother's name)* is a (age) G T P A L woman whose antenatal screens were: rubella (immune/nonimmune), VDRL (reactive/nonreactive), hepatitis B serum antigen (-/+), HIV (-/+ __ GA), GBS (+/- at __ GA) and blood group __. This pregnancy was uneventful/complicated by__________. (Celestone was administered at __ weeks gestation.) Membranes ruptured __hours prior to delivery. The infant was born vaginally/caesarian section. Apgar scores were __ at one minute and __at five minutes. (*Insert post-delivery management.)* He/she was appropriate/small/IUGR for gestational age with dysmorphic/ no dysmorphic features seen. The infant was admitted to the NICU/L2N and had the following problems.
Cord gases were normal, OR ____.

**** If the infant had a prolonged stay in the NICU, refer here to NICU discharge summary, and do NOT repeat all these details.****
Include only applicable headings below.

Respiratory Distress Syndrome/Bronchopulmonary Dysplasia:
The infant received __doses of BLES. (*Name)* was ventilated for __ days when he/she was extubated to NPCPAP. (*Insert any complications: HFO, chest tubes, nitric oxide.)* He/ she received (*number)* courses of dexamethasone. He/she was placed on low flow oxygen on __day of life. He/she is presently requiring *(therapy).* The last chest x-ray on (*date)* showed _____. The most recent blood gas shows __.

Apnea of Prematurity:
(Name) was loaded with caffeine citrate on __day of life. He/she is presently having __apneas per day/(or) is apnea free. Caffeine was discontinued on *(date).*

Patent Ductus Arteriosus/Cardiovascular Anomalies:
The infant was treated/not treated with a course of Indomethacin on *(date)* for a patent ductus arteriosus that presented clinically/(or) was confirmed on echocardiogram. *(Describe current status of murmur). (Repeat echocardiogram? Other cardiac anomalies? Follow-up?)*

Hyperbilirubinemia:
Mother's blood type is __and infant's blood type is __. Serum bilirubin peaked at __mmol/L at __day of life. The infant received __days of phototherapy.

Hematology:
(List any blood product transfusions). The most recent CBC on *(date)* showed a hemoglobin of__, WBC of__x 10^9/l, a platelet count of __,000 and no left shift.

Sepsis:
Cultures drawn following delivery were negative/(or) positive for *(name of organism).* The infant received a __*(# of days)* course of *(name of antibiotics).* Due to clinical deterioration(s) the infant had a partial/(or) full septic workup(s) on *(date)* which grew *(name of organism)* and was treated with *(name of antibiotic). During the neonatal course the infant had*__ episodes of sepsis which were culture negative/positive (state organism(s) if identified)

Neurological:
Cranial ultrasound(s) done on __day of life showed___*(include date and result of most recent ultrasound).* A follow-up ultrasound is recommended in __weeks.

Retinopathy of Prematurity (ROP):
Routine eye examinations were performed. The most recent examination on *(date)* revealed zone__stage __ with no plus disease. A follow-up exam is strongly recommended in __weeks to exclude progressive ROP. A follow-up eye appointment has been made at the eye clinic at McMaster for *(date and time).*

Fluids, Electrolytes and Nutrition:

Enteral feeds were started on __day of life and the infant achieved full enteral feeds on __day of life. Presently, the infant is receiving *(TPN and/or__cc q__hourly of expressed breast milk fortified with __package of human milk fortifier to __mls of EBM (or) name of formula by gavage, breast and/or bottle)* for a total fluid intake of __cc/hour. This provides __cc/kg/d or kcal/kg/d based on the current weight. On *(date)* the serum sodium was __mmol/L, calcium was__mmol/L, and phosphate was __mmol/.

Immunizations:

1. Synagis *(eligibility and date received or required and reference #).*
2. Pentacel *(date received or required),*
3. Prevnar *(date received or required).*
4. Hepatitis B Immunoglobin/Vaccination *(date received or required).*

Discharge Medications: Include iron, calcium/phosphate, vitamins

Neonatal Screens:

1. Newborn Screen was completed on *(date).*
2. Hearing screen was performed on *(date)* as per Ministry of Health guidelines. A pass/fail was obtained for one/both ears.

(Name) is being transferred to *(hospital/)* under the care of *(physician)* until he/she can be discharged home OR (*Name*) is being discharged home to the care of his parents/foster parents.

Follow-up

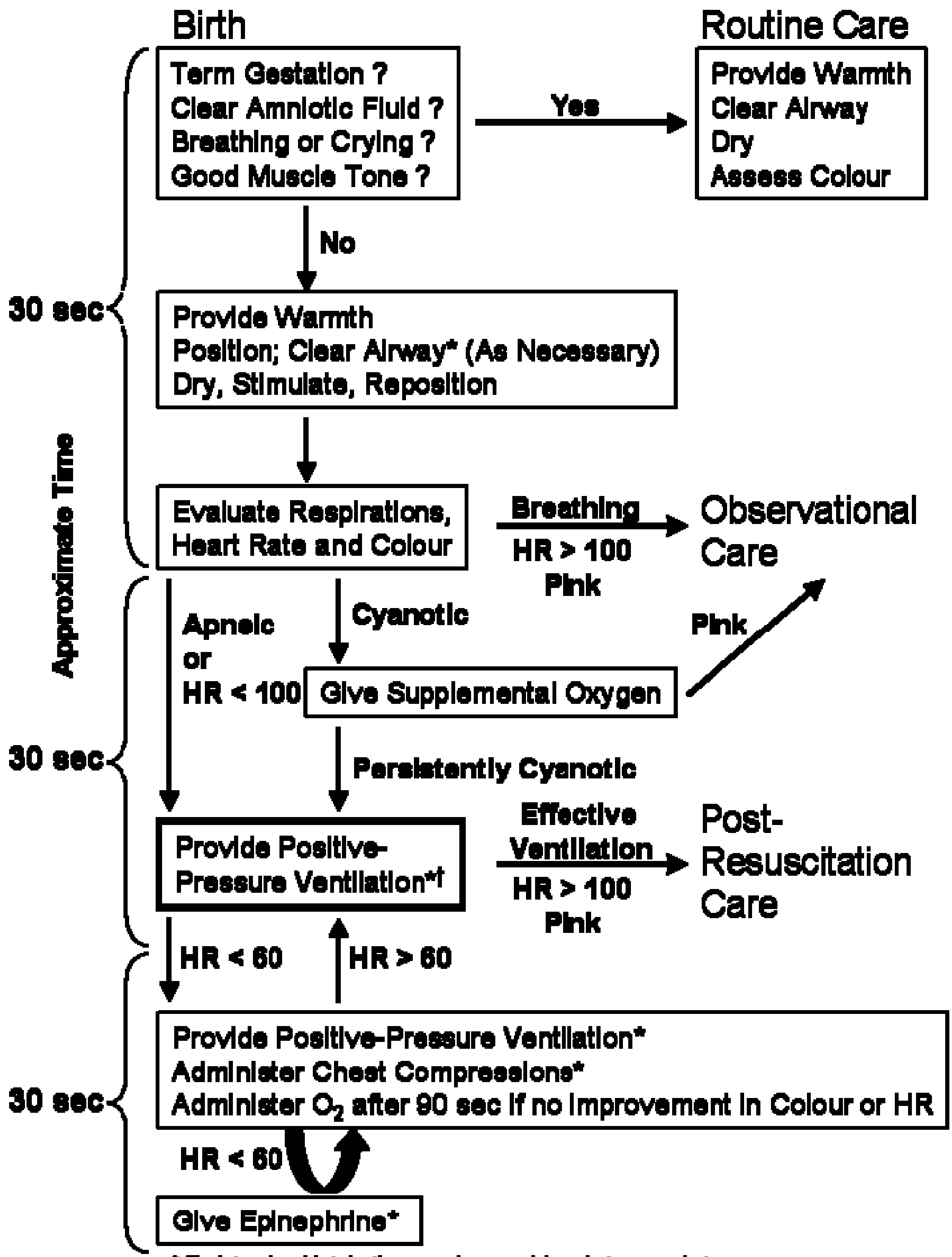
The infant requires follow-up for retinopathy of prematurity and cranial ultrasounds as well as *(indicate any follow-up required including growth and development, appointments, etc.)*

Thank you for accepting the care of this infant.

Name, Designation (CC\PGY), Pager Number

Dictating For Dr. (Name of Paediatrician/Neonatologist)

Overview of Resuscitation in the Delivery Room



* Endotracheal intubation may be considered at several steps
† Use room air with positive pressure ventilation

Adapted from Circulation 2005;112:III-91-99.
For use at McMaster Children's Hospital &St. Joseph's HealthCare, Hamilton, Ontario

NEONATAL RESUSCITATION DRUGS

		1 kg < 30 weeks	2 kg 30-36 weeks	3 kg > 36 weeks
Epinephrine 1:10,000 0.1 mg/ml q3-5 minutes	IV Route (Preferred Route) (0.01mg/kg)	0.1 ml	0.2ml	0.3 ml
	ETT Route (0.1 mg/kg)	1 ml	2 ml	3 ml
Sodium Bicarbonate	4.2% IV 0.5 mmol/ml (2 mmol/kg) For Prolonged Arrest	4 ml	8 ml	12 ml
Naloxone Contraindicated in narcotic dependent mothers	IV or IM 0.4 mg/ml (0.1 mg/kg)	0.25 ml	0.5 ml	0.75 ml
Volume Expanders	Normal Saline (NS, 0.9 NaCl) Packed Red Blood Cells	10 ml 10 ml	20 ml 20 ml	30 ml 30 ml
Glucose (D10W)	IV Bolus 200 mg/kg For documented hypoglycemia	2 ml	4 ml	6 ml

NICU NUTRITION GUIDELINES

ENTERAL FEEDING IN NICU

Method of Feeding (By Age)

	< 32 weeks	32-34 weeks	34-36 weeks	36-40 weeks
Gavage	Yes	Yes	If indicated	Not usually
Breast	Individual Assessment	1-2 q shift	Yes	Yes
Bottle		1-2 q shift Near 34 wks	Yes	Yes
Ad lib			Minimum feed Vol (cc)/ Time (hr)	Yes

FEEDING HUMAN MILK IN NICU

Human milk is the Feeding of Choice for All Infants in NICU

Expressed Breast Milk (EBM)

All infants should be established on feeds of EBM when available. If EBM is not available or not indicated then formula may be used either as a supplement to EBM or as the sole source of nutrition

NICU NUTRITION GUIDELINES (CONTINUED)

ENTERAL FEEDING IN NICU

Initiation and Advancement of Enteral Feeds (By Birth Weight and Age)

Infants < 1500 grams:

	< 750 grams	750 – 999 g ≥ 26 weeks	1000 - 1249 g ≥ 27 weeks	1250 - 1499 g ≥ 28 weeks
Initiate Trophic Feeds:	By 24-48 hr of age	By 24-48 hr of age		
Amount:	1 cc q 4 hr x 2 d	1 cc q 2 hr x 2 d		
Nutritional Feeds/Timing	At 72-96 hr of age	At 72-96 hr of age	By 24-48 hr of age	By 24-48 hr of age
Amount/ Frequency:	1 cc q 2 hr	2 cc q 2 h	1 cc q 2 hr	1 cc q 2 hr
Increase:	1 cc q 24 hr	1 cc q 24 hr x 2 d 1 cc q 12 hr	1 cc q 12 hr	1 cc q 8 hr

Infants > 1500 grams

	1500 - 1750 g ≥ 29 weeks	1750 - 1999 g ≥ 30 weeks	2000 - 2499 g ≥ 31 weeks	≥ 2500 g ≥ 34 weeks
Timing:	Day 1 / Stable	Day 1 / Stable	Day 1 / Stable	Day 1 / Stable
Amount/ Frequency	3 mL q 3 hr	6 – 9 mL q 3 hr	9 – 12 mL q 3 hr	12 – 15 mL q 3 hr or Ad lib
Increase:	3 mL q 9 hr	3 mL q 6 hr	3 mL q 3 hr	6 mL q 3 hr

Management of Residuals: See Feeding Practice Guidelines in Resource Binder

NICU NUTRITION GUIDELINES (CONTINUED)

FEEDING HUMAN MILK IN NICU

Expressed Breast Milk (EBM) + Similac Human Milk Fortifier

Initiate Fortification:

- When infant tolerating full volume feeds for approx. 48 hours and approx. 2 weeks of age

Dosing:

- Initially → 1 package fortifier per 100 mL EBM
- Increase → 1 package fortifier per 50 mL EBM after 48 hours
- Increase → 1 package fortifier per 25 mL EBM (maximum dose) for infants < 1200 g birth weight or infants not growing well

Continue Fortification:

- Until infant reaches at least 2.0 kg or is established at breastfeeding
- May be used for longer periods in nutritionally compromised infants
  - Until infant reaches at least 2.5 kg if growing well then reduce fortifier to 1:50
- If birth weight < 1200 g or BPD
  - Until infant reaches at least 3.0 kg or until discharged and consider supplemental Neosure post-discharge

NICU NUTRITION GUIDELINES (CONTINUED)

FEEDING HUMAN MILK IN NICU

Formula Selection

Infant Age or Weight	*Formula Type*
< 34 weeks OR < 2.0 kg	Similac Special Care (SSC) 24
Once weight 2200 – 2500 g switch to	Term Forumla*
If weight remains < 10 % consider	Similac Advance Neosure
If birth weight < 1200 g or BPD use	Preterm Formula
Until Discharge or 3.0 kg then switch	Neosure
≥ 34 weeks OR ≥ 2.0 kg birth weight	Term Formula*

*Term Formulas: Similac Advance, Enfamil A+, Goodstart
Parents may choose formula they wish to use

Nutrient Composition of Fortified Human Milk / SSC 24/100 mL

Nutrient	Unfortified	**Fortified 1:50**	Fortified 1:25	SSC 24
Energy (kcal/100 mL)	70	**77**	84	80
Protein – g	1.3	**1.85**	2.3	2.4
Calcium - mmol	0.5	**1.98**	3.45	3.1
Phosphorus – mmol	0.4	**1.43**	2.52	2.3
Vitamin A – IU	363	**670**	983	814
Vitamin D – IU	-	**60**	119	122
Sodium – mmol	1.0	**1.3**	1.7	1.8
Potassium - mmol	1.4	**2.2**	3	2.5
Iron – mg	0.11	**0.29**	0.46	0.3

Note: Max. protein intake with normal renal function 4 g/kg/day

Vitamin / Mineral Supplements using Similac HMF:

1:50:Poly-Vi-Sol 0.5 mL daily ; Iron as per guidelines
1:25:Poly-Vi-Sol 0.5 mL daily until weight 1.8 kg; Fe as per guidelines

NICU NUTRITION GUIDELINES (CONTINUED)

TOTAL PARENTAL NUTRITION (TPN) IN NICU – SUMMARY GUIDELINES

Starting TPN

Infants < 1500 g → Start on modified TPN
Neostarter (D10W + Protein + Calcium @ 50 cc/kg/day) on Day 1 and TPN by 48 hours of age
Infants > 1500 g → Start on TPN by 48-72 hr of age if NOT expected to be enterally fed by 72 hr

Stopping TPN: TPN may be discontinued when an infant is tolerating 75% of full enteral feeds

Writing TPN Orders

- Determine total fluid available for TPN. (*Total fluid intake minus fluid for IV lines / medications)*
- Determine flow rate required to provide desired amount of lipid (*see summary*).
- The remaining fluid should be used for amino acid / dextrose solution

Monitoring TPN (TPN) Bloodwork

For infants who have been on TPN > 48 hours; Every **Tuesday** (‘Week' represents week of the month)

Lab \ Week →	1	2	3	4	5
Electrolytes: Na, K	x	x	x	X	x
Glucose*	x	x	x	X	x
Triglycerides	x	x	x	X	x
Urea / Creat	x		x		
Ca / P	x		x		
Bili		x		X	x
AST / ALT		x		X	
Albumin				X	

Every **Friday**: electrolytes (Na, K), Glucose*, Triglycerides (until tolerating full dose)
Trace Elements: if on long term TPN, once direct bili > 50 mmol/L send serum for trace elements (Zn, Cu, Se , Mn) – 0.6 mL
Ferritin: Infants > 6 weeks of age on TPN, check serum ferritin before adding iron
*send urine for glucose if PCX > 9 mmol/L

NICU NUTRITION GUIDELINES (CONTINUED)

TOTAL PARENTAL NUTRITION (TPN) IN NICU – SUMMARY GUIDELINES

(A) Macronutrients

Dextrose

Prescription	mg/kg/min	g/kg/day
Initial dose	4 – 6	6 - 9
Average Daily Increase	0.5 - 1.0	0.7 - 1.4
Maximum dose	11 – 13	16 - 19

Energy Value: 3.4 kcal/g
Conversions: 1 mmol = 0.2 g = 200 mg
Comments: For peripheral parenteral nutrition, the osmolar load from dextrose should not exceed 500 mmol/L (D10W) unless necessary to maintain euglycemia

Protein

Prescription *Source*: Primene 10%	g/kg/day
Initial dose *	**1.5**
Avg. daily increase	**1.0**
Maximum usual dose	3.0 - 3.5**

Energy Value: 5.2 kcal/g; 21.8 kJ/g
For infants < 1500 g → Start on modified TPN → Neostarter (D10W + Protein + Calcium @ 50 cc/kg/day) on Day 1 and TPN by 48 hours of age, with other IVs
**3 g/kg/day acceptable for term infants
Monitor / reassess maximum protein dose:

- Renal Failure
- Hepatic Failure
- Elevated Serum Urea

NICU NUTRITION GUIDELINES (CONTINUED)

TOTAL PARENTAL NUTRITION (TPN) IN NICU – SUMMARY GUIDELINES

<u>(A) Macronutrients</u> (Continued)

Lipid

Prescription *Source*: Intralipid 20%	Birth Weight < 750 g	Birth Weight >750 g
Initial Dose (g/kg/day)	By 48 hr of age 0.5 - 1.0	By 48 hr of age 0.5 - 1.0
Average Daily Increase (g/kg/day)	After 48-72 hr on initial dose 0.5 (or 1.0 q other day)	0.5 - 1.0
Maximum Dose (1) (g/kg/day)	3.0 - 3.5	3.0 - 3.5

Energy Value: 20% - 2 kcal / mL; 8.4 kJ / mL
Conversions: 20% - 0.21 g fat / mL
Cautions:

- For infants with worsening acute lung disease or hyperbilirubinemia (unconjugated), Hold lipid at 0.5 - 1.0 g/kg/day until clinical condition improves
- Sepsis - decreased lipid to 1 g/kg/day for first 24 - 48 hr and then increase as tolerated to full rates

Monitor / reassess:

- Triglycerides (TG) every Tuesday and Friday until tolerating maximum dose, then every Tuesday Interpretation: TG < 1.7 desirable; TG < 2.2 acceptable

NICU NUTRITION GUIDELINES (CONTINUED)

TOTAL PARENTAL NUTRITION (TPN) IN NICU – SUMMARY GUIDELINES

(B) Micronutrients

Minerals (Maintenance intakes for stable, growing infants)

	Usual Dose (mmol/kg/day)	Term Infants > 3kg (mmol/kg/day)
Sodium	2 - 4 **(1)**	2
Potassium	1 - 2	2
Magnesium	0.2	0.2
Calcium	1 - 1.5 **(2)**	1
Phosphorus	1 - 1.5 **(2)**	1

Vitamins

Source: MVI Paediatric (MVI Ped)

Dosage: By pharmacy, on weight (Initiate at 48 hr of age)

Trace Elements

Source:

mcg / mL →	Zinc	Copper	Selenium	Chromium	Manganese	Iodine
Neo Trace Element Mix	425	19	2	0.2	1	1
Liver Mix*	425	10	2	0.2		1

*To be used when direct bilirubin > 50 mmol/L; Send blood for trace elements when changed to Liver Mix

Dosage: 1 mL/kg (Maximum: 3 mL)

Iron: 0.1-0.2 mg/kg (Initiate at 6 weeks of age for infants on TPN if ferritin <500)

(1) Actual requirements for sodium may be significantly higher in the first two weeks of life, depending on urinary losses.

(2) Due to the limits of solubility of calcium and phosphorus in amino acid solutions, the maximum dose of 15 mmol of calcium and phosphorus per litre of amino acid solution can only be attained if the total amino acid concentration is 30 g/L or higher. Otherwise, precipitation of calcium and phosphorus may occur.

Caution: do not add phosphorus to TPN unless there is at least 1 g/kg amino acids added to the solution. Normal molar ratio of Ca:P is 1:1. Use caution if unequal amounts of calcium and phosphorus added to TPN solution.

NICU NUTRITION GUIDELINES (CONTINUED)

VITAMIN/MINERAL SUPPLEMENTS IN NICU – SUMMARY GUIDELINES

Vitamins		**Prescription**	
	Feeding	**Poly-vi-sol**	**D-Vi-Sol**
Preterm Infants In Hospital (< 2000 grams)	Unfortified EBM	0.5 mL BID	None
	Fortified (1:25) EBM	0.5 mL daily until weight 1.8 kg	None
	SSC 24	0.5 mL daily until weight 1.8 kg	None
Term Infant	EBM	none	1.0 mL OD
	Formula	none	None
Preterm Infants After Discharge Home	Human Milk or Regular Infant Formula	Intake < 800 mL/day – 0.5-1.0 mL daily	None
		Intake > 800 mL/day - none	1.0 mL OD (human milk only)

1.0 mL Poly-Vi-Sol contains: 10 ug (400 IU) Vitamin D, 450 ug (1500 IU) Vitamin A, 30 mg Vitamin C, 0.5 mg Thiamin, 4.0 mg Niacin, 0.6 mg Riboflavin

1.0 mL D-Vi-Sol contains: 400 IU Vitamin D

Iron (Fe)	**Prescription: Ferrous Sulfate** (1.0 mL = 15 mg elemental Fe)		
Preterm infants in hospital	@ 4-6 weeks of age:	< 1 kg	Iron 2.5 mg
		≥ 1 kg & < 2 kg	Iron 5 mg
		≥ 2 kg	Iron 7.5 mg
Preterm Infants after discharge (See Notes below)	**Prescription: Fer-In-Sol** (Mead Johnson) (1.0 mL = 15 mg elemental Fe)		
	< 3-4 kg	0.5 mL OD (7.5 mg)	
	> 3-4 kg	1.0 mL OD (15 mg)	

1. P-RNI for iron: 2-4 mg/kg/day up to max. 15 mg elemental iron given as ferrous sulfate supplement or iron fortified formula. (Birth Weight < 1 kg: 3-4 mg/kg/day; > 1 kg: 2-3 mg/kg/day)
2. Prescription amounts above are given as elemental iron (check dosage on product used). (1 mg elemental iron =5 mg total iron)

PREVENTION OF PERINATAL GROUP B STREPTOCOCCAL (GBS) DISEASE [1]

McMaster Children's Hospital (Perinatal Division) and St. Joseph's Healthcare (Maternal Newborn Directorate), November 2002

ALL Women Receive a Vaginal and Rectal GBS Culture at 35-37 Weeks' Gestation∗:

Intrapartum Antibiotic Prophylaxis	
NOT Indicated:	**Indicated:**
• Previous pregnancy with a Positive GBS screening culture and a Negative screen during current pregnancy • Planned C/S delivery performed **without** onset of labor or membrane rupture • Negative GBS screening culture, regardless of intrapartum risk factors	• Previous infant with invasive GBS disease (*no GBS screen required) • GBS bacteriuria during current pregnancy (*no GBS screen required) • Positive GBS screen culture during current pregnancy (unless planned C/S) • Unknown GBS Status AND any of the following risk factors: o Delivery at < 37 weeks gestation o Membrane rupture for ≥ 18 hours (during labor) o Intrapartum fever ≥ 38° C ♣

∗ No GBS screen required if a woman had GBS bacturia during the current pregnancy or a previous infant with invasive GBS disease

♣ If amnionitis suspected, broad-spectrum antibiotic therapy, including an agent known to be active against GBS, should replace GBS prophylaxis

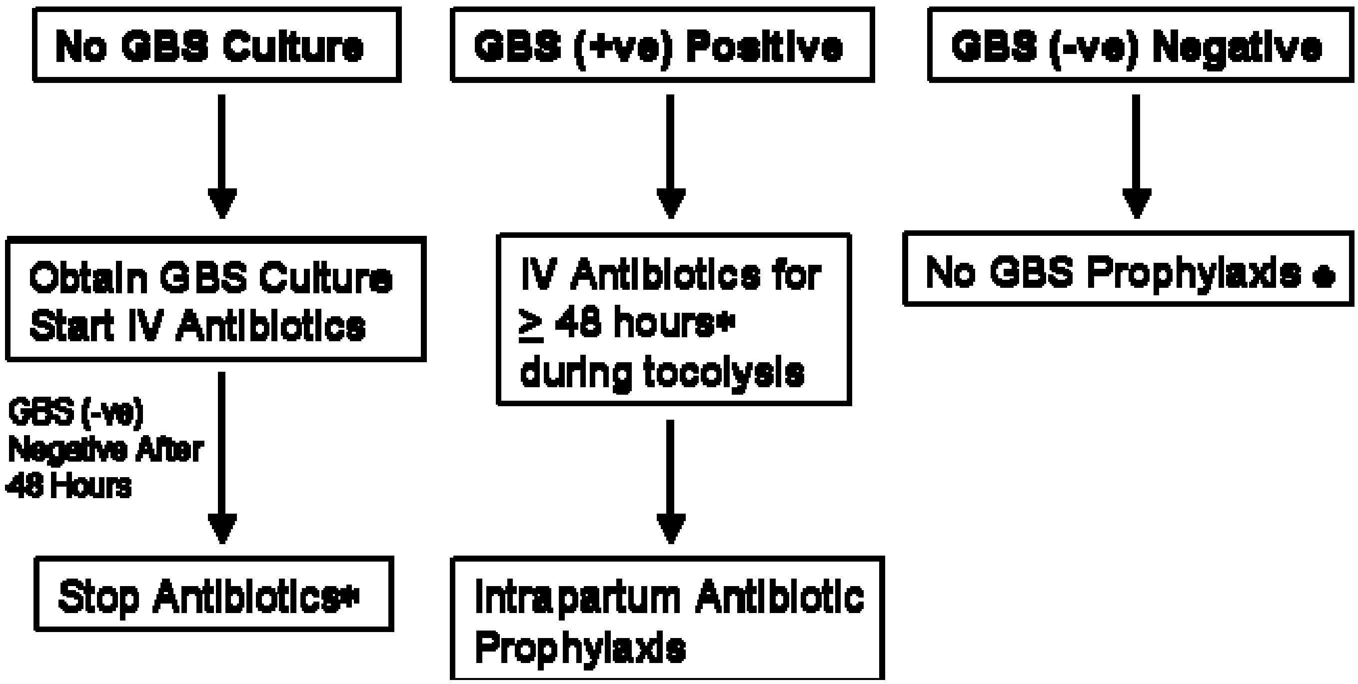
Section References

1. Centers for Disease Control. Prevention of Perinatal Group B Streptococcal Disease: MMWR 2002; 51(RR11):1-22
2. Centers for Disease Control. Prevention of Perinatal Group B Streptococcal Disease: a public health perspective. MMWR1996;45(RR-7):1-24
3. American Academy of Pediatrics, Committee on Infectious Diseases and Committee on Fetus and Newborn. Revised guidelines for prevention of early onset group B streptococcal(GBS) disease. Pediatrics 1997;99:489-96
4. Preventing group B streptococcal infections: New recommendations. Paediatr Child Health 2002; 6:380-383
5. Boyer KM, Gadzala CAL et al. Prevention of early onset neonatal group B streptococcal disease with selective intrapartum chemoprophylaxis. N Engl J Med 1986; 314:1665-1669

PREVENTION OF PERINATAL GROUP B STREPTOCOCCAL (GBS) DISEASE (CONTINUED)[1]

GBS Prophylaxis for Women < 37 weeks gestation with:

- Onset of Labor <u>or</u> Rupture of Membranes and
- Significant risk for imminent/threatened preterm delivery



∗Antibiotics should be continued for a total of at least 48 hours, unless delivery occurs sooner. At the physician's discretion, antibiotic prophylaxis may be continued beyond 48 hours in a GBS culture positive woman if delivery has not yet occurred. For women who are GBS culture positive, antibiotics should be reinitiated when labor that is likely to proceed to delivery occurs.

♣ If delivery has not occurred within 4 weeks, a vaginal and rectal GBS screening culture should be repeated and the patient managed based on the result of the repeat culture.

PREVENTION OF PERINATAL GROUP B STREPTOCOCCAL (GBS) DISEASE (CONTINUED)[1]

Management of the Newborn

Maternal Intrapartum Antibiotic Prophylaxis (IAP) Use For GBS + ve Mother → Consider CBC at 4 hours •

Maternal Antibiotics for Suspected Chorioamnionitis? — Yes → Full Diagnostic Evaluation♥ Empiric Therapy♠

Maternal IAP Use For GBS + ve Mother — Yes → Signs of Neonatal Sepsis?

- Yes → Full Diagnostic Evaluation♥ Empiric Therapy♠
- No → Gestational Age
  - < 35 Weeks → Limited Evaluation Ψ; Observe ≥ 48 hours; If Sepsis is Suspected: - Full Diagnostic Evaluation♥ - Empiric Therapy♠
  - ≥ 35 Weeks → Duration of IAP Before Delivery ♦
    - < 4 Hours → Limited Evaluation Ψ; Observe ≥ 48 hours; If Sepsis is Suspected: - Full Diagnostic Evaluation♥ - Empiric Therapy♠
    - ≥ 4 Hours → No Evaluation; No Therapy; Observe 24-48 Hours ♣

• If no maternal IAP for GBS despite an indication being present, there are insufficient data to recommend a single management therapy. Consider CBC at 12 hours, if CBC at 4 hours is abnormal. If 12 hour CBC is abnormal, consider treatment

♥ CBC with differential at 4 hours, blood C&S and a CXR if respiratory abnormalities are present. When signs of sepsis are present, a lumbar puncture, if feasible, should be performed.

Ψ CBC with differential at 4 hours and blood culture

♠ Duration of therapy varies on results of blood C&S, CSF findings (if done) and clinical course of infant. If lab results and clinical course do not indicate bacterial infection, duration may be as short as 48 hours.

♦ Applies only to penicillin, ampicillin or cefazolin, assumes recommended dosing regimens.

♣ A healthy appearing infant who was at least ≥ 38 weeks' gestation at delivery and whose mother received at least one dose ≥ 4 hours of I.A.P. before delivery may be discharged home after 24 hours of observation, if other discharge criteria have been met.

PREVENTION OF PERINATAL GROUP B STREPTOCOCCAL (GBS) DISEASE (CONTINUED)[1]

Recommended Antibiotics for GBS Prophylaxis

Recommended

Penicillin G 5 million Units IV STAT then 2.5 million Units IV q4h until delivery

Alternative

Ampicillin 2g IV STAT then 1g IV q4h until delivery

If Penicillin-Allergic → Determine Risk for Anaphylaxis:

If <u>Low Risk</u> for Anaphylaxis

Cefazolin 2g IV STAT then 1g IV q8h until delivery

If <u>High Risk</u> for Anaphylaxis

Criteria:

- Have experienced immediate hypersensitivity to penicillin including a history of penicillin related anaphylaxis OR
- Asthma or other diseases that would make anaphylaxis more dangerous to treat (eg. Being treated with β-Blocker)

Then Determine Susceptibility to Clindamycin and Erythromycin on Prenatal GBS Isolated →

If GBS <u>susceptible</u> to Clindamycin and Erythromycin:

Clindamycin 900 mg IV q8h until delivery
OR
Erythromycin 500 mg IV q6h until delivery

If GBS <u>resistant</u> to Clindamycin and Erythromycin OR Susceptibility Unknown:

Vancomycin 1g IV q12h until delivery

- Reserved for Penicillin-Allergic women at High Risk for Anaphylaxis

HYPOGLYCEMIA GUIDELINES FOR THE AT-RISK NEWBORN

Signs and Symptoms of Hypoglycemia:

- Jitteriness, tremors
- Episodes of cyanosis
- Convulsions
- Apnea
- Tachypnea
- Weak or high-pitched cry
- Limpness, lethargy, hypotonia
- Difficulty feeding, refusal to feed
- Eye rolling
- Sweating, sudden pallor
- Cardiac arrest

Risk Factors for Hypoglycemia

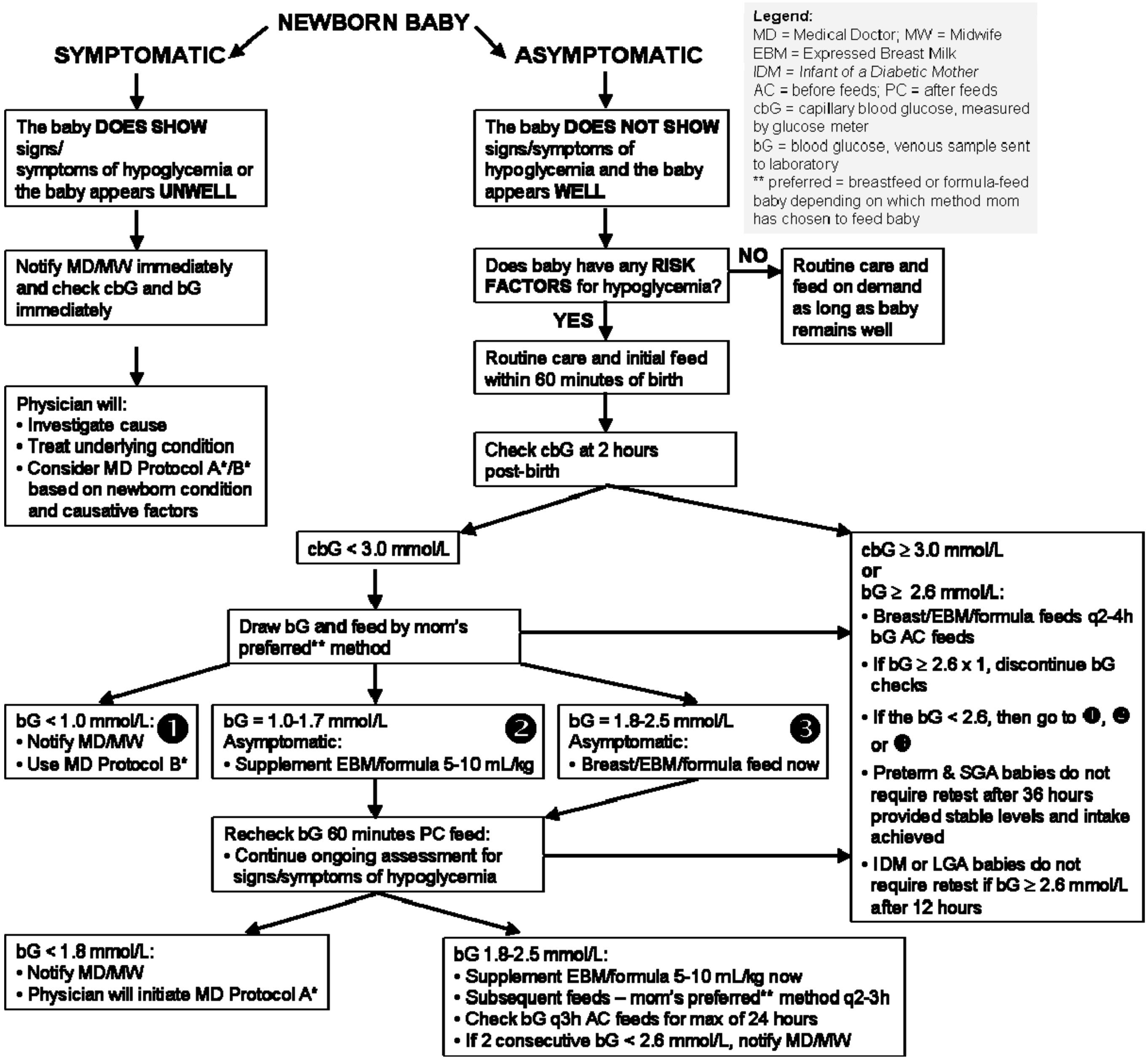
- Maternal hypertension treated with beta-blockers
- Any maternal diabetes (gestational, Type I or II, with or without insulin)
- Preterm – less than 37-0/7 weeks
- Cold stress – Hypothermia: Temp (Axillary) < 36.5 °C
- Newborns with medical conditions (eg. respiratory distress, sepsis)
- SGA < 5th percentile for birth weight and gestational age
- LGA > 95th percentile for birth weight and gestational age

Gestation (completed weeks)	Male Weight in gm		Female Weight in gm	
	SGA	**LGA**	**SGA**	**LGA**
36	Less than or equal to **2144**	Greater than or equal to **3604**	Less than or equal to **2052**	Greater than or equal to **3523**
37	Less than or equal to **2384**	Greater than or equal to **3857**	Less than or equal to **2286**	Greater than or equal to **3752**
38	Less than or equal to **2605**	Greater than or equal to **4065**	Less than or equal to **2502**	Greater than or equal to **3931**
39	Less than or equal to **2786**	Greater than or equal to **4232**	Less than or equal to **2680**	Greater than or equal to **4076**
40	Less than or equal to **2927**	Greater than or equal to **4382**	Less than or equal to **2814**	Greater than or equal to **4212**
41	Less than or equal to **3025**	Greater than or equal to **4512**	Less than or equal to **2906**	Greater than or equal to **4330**
42	Less than or equal to **3070**	Greater than or equal to **4631**	Less than or equal to **2954**	Greater than or equal to **4423**

References:

Kramer et al. (2001). It is recognized that these weights deviate from the CPS Guidelines (2005) of the 10th and 90th percentile cut-offs for birth weight at term.
ACoRN – Acute Care of at-Risk Newborns. (2005)
Canadian Pediatric Society. Screening Guidelines for Newborns at Risk for Low Blood Glucose. Pediatrics and Child Health. (2004).

HYPOGLYCEMIA GUIDELINES FOR THE AT-RISK NEWBORN

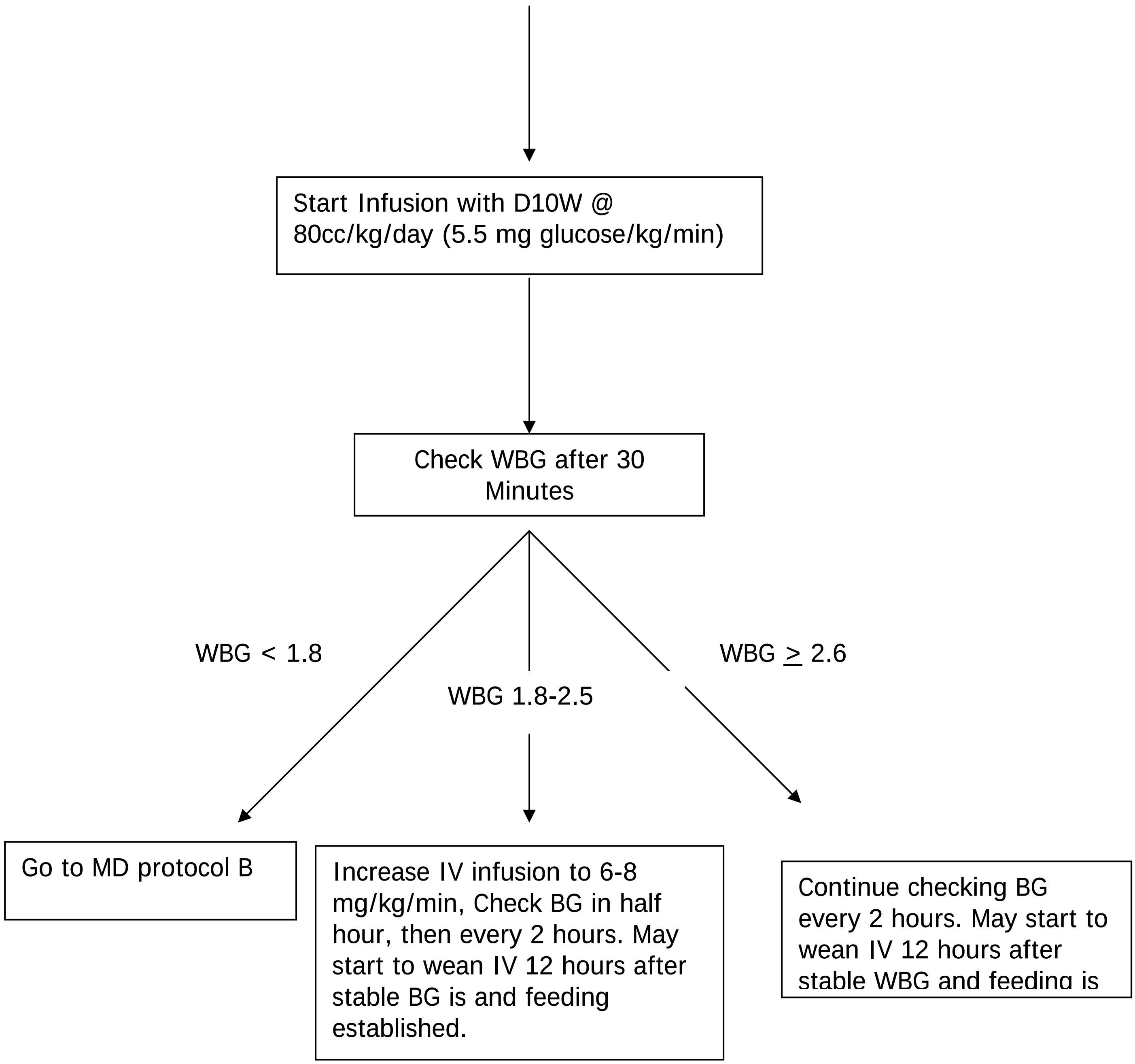


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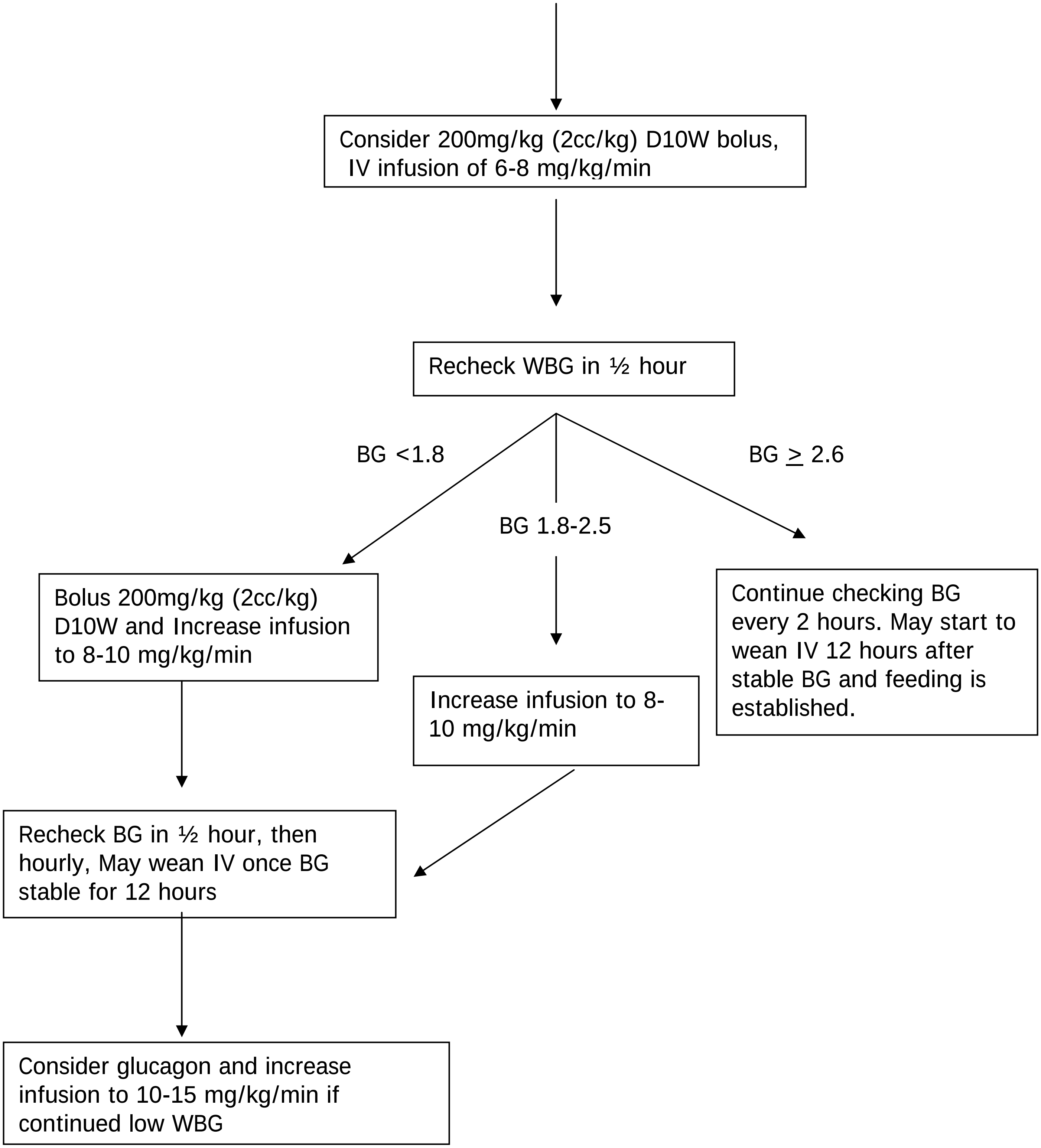
1. Ongoing newborn assessment and timely interventions should not be limited by these guidelines. If at any point the newborn is symptomatic or otherwise unwell, notify the Family Physician or Midwife who may then choose to consult a Pediatrician.
2. If baby is unable to feed at any point in these guidelines, notify the Family Physician or Midwife. He/she will then assess the need for consult/transfer of care to a Pediatrician.

* When the need for MD Protocol A or B arises, if not already in place, the Family Physician or Midwife will consult/transfer care to a Pediatrician.

MD Protocol A



MD Protocol B



Remember for care of baby in NICU or SCN

- Frequent boluses of D10W will induce an insulin surge and rebound hypoglycemia. It is recommended that a **maximum** of 2 boluses of D10W be used.

- Consider daily maintenance of fluid. Once reaching 120 cc/kg/day, in the first 24 hours of life, consider switching to D12.5W/D15W in order to increase glucose concentration but maintain fluid status. A central line must be used when infusing glucose > D12.5W.

- When considering glucagon, think hypopituitarism, hyperinsulinism or a metabolic defect. When the blood sugar is < 1.8mmol/l, get a critical sample of glucose, insulin, GH, cortisol, T4, TSH, gas, lactate and urinary ketones also consider plasma ketones, pyruvate, FFA, organic and amino acids prior to starting glucagon.

- Glucagon 0.3 mg/kg/dose bolus not to exceed 1 mg total dose **OR** continuous infusion of 1mg/day (to a maximum of 2mg/day). Add 1 mg to 24 ml of D10W and run at 1ml/hour through a separate IV line.

- Glucose monitoring should be q ½ hour to q1hour until stable then q3-4hours.

- May start weaning IV 12 hours after stable BG and feeding is established. When weaning glucose, wean slowly. Wean the concentration of the glucose to D10W first, which will decrease the rate of glucose infused then wean the rate to 4-6mg/kg/min (1cc q1-4hours depending on the initial severity of the hypoglycemia) and finally the glucagon. Wean glucagon 0.1cc every 6-12 hours depending on the initial severity of the hypoglycemia.

- If hypoglycemia is resistant to treatment or unable to wean off the glucagon, **consult endocrinology** before instituting further therapies. Consider Diazoxide 8-15 mg/kg/day p.o. TID -QID Hydrocortisone 5 mg/kg/day IV QID or Prednisone 2mg/kg/day p.o..

- Remember severe and persistent hypoglycemia may be associated with a significant risk for short and long-term morbidity and mortality. Thus prompt recognition and treatment is essential.

D10W = 10 gms / 100ml
= 10,000mg / 100ml
= 100mg / ml

Example:

To give a 3 kg child 5 mg / kg / min

1. 5mg / kg / min x 3 kg = 15 mg / min
2. 15 mg / min x 60 min = 900 mg / hour
3. D10W has 100 mg / ml, so 900 mg / hour = 9 cc / hour
4. Therefore, to give a child of 3 kg, 5 mg / kg / min of glucose, run D10W at 9 cc / hour.

HYPERBILIRUBINEMIA (JAUNDICE) IN THE NEWBORN INFANT ≥ 35 WEEKS OF GESTATION

Primary Prevention

- Promote and support successful breastfeeding. Breastfeeding is not contraindicated in the presence of jaundice; more frequent breastfeeding may be beneficial. **Exception:** high probability of exchange transfusion.
- Do not supplement breastfed infants with water or dextrose. There is no evidence that excessive fluid administration affects serum bilirubin concentration unless the infant is dehydrated.

Secondary Prevention

- Clinical Assessment for jaundice q8-12h with vitals
- However, recognize visual estimation of the degree of jaundice can lead to errors, particularly in darkly pigmented infants and is not recommended

If Jaundiced Inpatient → Evaluation and Investigations:

Note: These are mandatory for hyperbilirubinemia requiring phototherapy

History	**Physical Examination**
• description of labour and delivery • infant's clinical course • feeding regimen, sleep/lethargy • stool, urine frequency • family history/ethnicity	• extent of jaundice/pallor • bruising/cephalhematomas • polycythemia • weight loss/hydration
Laboratory	**Consider**
• Serum bilirubin concentration and conjugated bilirubin • complete blood count and differential • blood smear for red cell morphology • blood group and direct antibody test	• sepsis • reticulocyte count screen • G6PD Screen • Coombs' test, if indicated • serum electrolytes, albumin/protein • TSH, Galactosemia screen

- If jaundice persists > 7 days and not improving, or conjugated bilirubin > 20% of the total bilirubin, **consult with a specialist.**
- Measure the total bilirubin on all infants jaundiced in the first 24 hours and consider consult with a specialist since jaundice occurring < 24 Hours of age is considered "pathologic" until proven otherwise

HYPERBILIRUBINEMIA: Secondary Prevention
(IN THE NEWBORN INFANT ≥ 35 WEEKS OF GESTATION)

Assessment Before Discharge

Before discharge every newborn should be assessed for risk of developing hyperbilirubinemia. The bilirubin nomogram for follow up of babies can be very helpful if a bilirubin has been done prior to discharge.

Risk of developing hyperbilirubinemia in infants 35 or more weeks of gestation:

Major Risk Factors:

Predischarge bilirubin in the high risk zone
Jaundice observed in the first 24 hours
Hemolysis due to ABO incompatibility or other causes
Gestational age 35-36 weeks
Previous sibling received phototherapy
Cephalhematoma or significant bruising
Exclusive breast-feeding, particularly if nursing is not going well and there is excessive weight loss
East Asian race

Minor Risk Factors:

Predischarge bilirubin in the high intermediate risk zone
Gestational age 37-38 weeks
Jaundice observed before discharge
Previous sibling received phototherapy
Macrosomic infant of a diabetic mother
Maternal age ≥ 25 years
Male gender

There should be **heightened vigilance** for clinical or visual signs and symptoms of jaundice if the baby has any Major Risk Factors for severe hyperbilirubinemia

CLINICAL PATTERNS OF HYPERBILIRUBINEMIA

Sixty percent of term infants will become clinically jaundiced in the first week of life. In the vast majority of cases, neonatal jaundice is physiologic, mild, benign, self-limiting and normal. This "normal" form of neonatal jaundice has been referred to as "physiological jaundice of the newborn" or "developmental hyperbilirubinemia". However, in about 2% of jaundiced newborns, the hyperbilirubinemia is non-physiologic – it is pathologic. In these pathologic cases, the bilirubin concentrations rise to potentially dangerous levels. Some studies report 85% of newborn re-admissions to hospital during the first week of life are because of jaundice.

The clinical challenge is to identify when neonatal jaundice has become non-physiologic and to implement ***RISK REDUCTION STRATEGIES*** *in a timely manner to prevent the occurrence of severe hyperbilirubinemia.*

Pathologic Jaundice

Pathologic jaundice is present in the first 24 hours of age. If TSB levels are greater than the 75th percentile (ie. in the high-intermediate risk zone or higher) at less than 72 hours of age, then the infant is at particularly high risk for other adverse events because the rate of bilirubin rise has been so rapid. If the bilirubin continues to rise at the same rate, then the bilirubin levels will exceed the 95th percentile within the first 7 days of age.

Pathologic jaundice (hyperbilirubinemia) may be related to:

- hemolytic disease: ABO, Rh or minor blood group incompatibilities.
- non-hemolytic disease: extravascular sources, eg. cephalohematoma
- G6PD deficiency – may be the cause of kernicterus in up to 35% of cases - always suspect in cases of severe hyperbilirubinemia or poor response to phototherapy
- decreased bilirubin conjugation – genetic disorders (Crigler-Najjar, Gilbert Syndrome), hypothyroidism
- impaired bilirubin excretion – biliary obstruction (biliary atresia), infection, metabolic disorders, chromosomal abnormalities (Turner's), drugs (ASA, sulfa, erythromycin)

Physiologic Jaundice

Neonatal hyperbilirubinemia is an almost universal finding during the first week of life. Most newborns experience a transient elevation of their serum bilirubin and this is termed ‘physiologic jaundice’. The mechanisms responsible for the slightly elevated TSB levels in these infants are reflected in a combination of the effects of bilirubin production, conjugation, and enterohepatic circulation. The factors that affect these processes account for the hyperbilirubinemia in virtually all newborns. Some infants have a slower rise in their TSB (Total Serum Bilirubin) levels and may demonstrate severe hyperbilirubinemia after 72 hours of age (usually post-discharge).

Breastfeeding and Jaundice

The jaundice associated with breastfeeding in the first two to four days of life is sometimes called “breastfeeding jaundice”. Breastfeeding that is not going well, has been identified as one of the most consistent risk factors for the development of severe hyperbilirubinemia, especially in late preterm newborns (Watchko, 2006). Breastfeeding jaundice is not associated with increased bilirubin production. Rather, inadequate breastmilk intake, in addition to contributing to varying degrees of dehydration and weight loss, acts as a stimulus to increase the enterohepatic circulation of bilirubin. Earlier studies have shown that the enterohepatic circulation of bilirubin accounts for up to 50% of the hepatic bilirubin load in newborns. When the hepatic immaturity of the newborn is considered, particularly in the late preterm newborn, any further increase in the hepatic bilirubin load will likely result in more marked hyperbilirubinemia (Watchko, 2006).

SIGNS AND SYMPTOMS OF HYPERBILIRUBINEMIA REQUIRING MEDICAL INVESTIGATION

- jaundice in first 24 hours of age

- excessive level of, or rapid increase in, TSB after 24 hours of age
  - TSB level crosses into next highest risk zone on bilirubin nomogram

- TSB levels not responding to phototherapy (ie. TSB level not decreasing, or TSB level increasing)

- excessive weight loss
  - greater than 7% in first 48 hours
  - greater than 10% after 48 hours

- pallor

- vomiting

- lethargy

- poor feeding, particularly exclusive breastfeeding not going well

- hepatosplenomegaly

- apnea

- temperature instability

- tachypnea

HOUR-SPECIFIC BILIRUBIN NOMOGRAMS

It is recommended that bilirubin levels in the healthy, late preterm and term infant (35 or more weeks' gestation) be interpreted using hour-specific bilirubin nomograms. Based on the infant's age in hours, nomograms can be used to plot an infant's Total Serum Bilirubin (TSB) level to determine the need to initiate phototherapy treatment in conjunction with specific risk factors for severe hyperbilirubinemia; or to plot an infant's TSB level prior to discharge to screen for the risk of developing severe hyperbilirubinemia.

Notes on *Late Preterm* vs. T*erm* infants with regard to hyperbilirubinemia (as per CPS position statement):

When considering hyperbilirubinemia in the newborn infant:

Late Preterm is defined as: 35 – 37 6/7 weeks gestation*
Term is defined as: 38 0/7 weeks gestation and older*

This is an important factor to consider. Infants of 35 to 36 weeks gestation are about 13 times more likely than those at 40 weeks gestation to be readmitted for severe jaundice. These "late preterm" infants receive care in well-baby nurseries, but unlike their term peers, they are much more likely to nurse ineffectively, receive fewer calories, and have greater weight loss. In addition, the immaturity of the liver's conjugating system in the late preterm infant makes it much more difficult for these infants to clear bilirubin effectively. Thus, it is much more likely, and not surprising that these late preterm infants become more jaundiced.

Included in this learning package are three different hour-specific bilirubin nomograms for infants 35 or more weeks' gestation

⇒ Bilirubin Nomogram for Initiation of Phototherapy
  - guidelines for initiation of phototherapy HAVE NOT changed

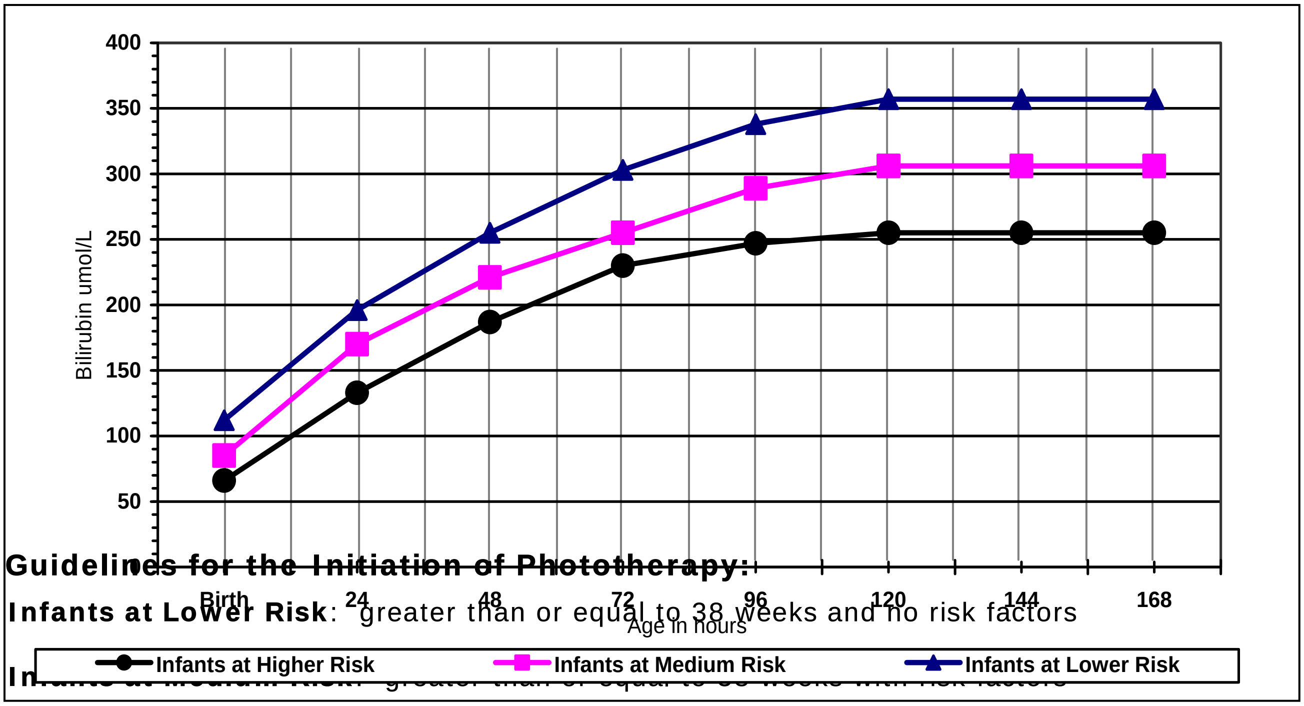
⇒ Total Serum Bilirubin Screening Assessment Nomogram
  - guidelines for screening assessment

⇒ Bilirubin Nomogram for Exchange Transfusion
  - guidelines for exchange transfusion HAVE NOT changed

* the gestational ages given for 'late preterm' and 'term' are as per CPS position statement for the management of hyperbilirubinemia

Hyperbilirubinemia in the Newborn Infant
35 or More Weeks of Gestation

Guidelines for ***initiation*** *of phototherapy for hyperbilirubinemia.*



Guidelines for the Initiation of Phototherapy:

Infants at Lower Risk: greater than or equal to 38 weeks and no risk factors

Infants at Medium Risk: greater than or equal to 38 weeks with risk factors
or 35 - 37 6/7 weeks and no risk factors

Infants at Higher Risk: 35 - 37 6/7 weeks with risk factors

Risk Factors for Bilirubin Toxicity for Initiation of Phototherapy:

⇒ ABO or Rh incompatibility: hemolysis due to maternal isoimmunization. (Some other causes of hemolysis to consider if there is a positive family hx of: G6PD deficiency, pyruvate kinase deficiency, congenital spherocytosis)

⇒ sepsis, temperature instability, significant lethargy

⇒ need for resuscitation at birth/asphyxia (baby required significant resuscitation and admission to L2N or NICU at MUMC or to NICU at SJH)

⇒ evidence of metabolic or respiratory acidosis as evidenced by cord gas pH < 7.2

⇒ low serum albumin less than 30g/L (if measured)

➢ Jaundice occurring before 24 hours of age is considered “pathologic” and requires investigation and consideration for Pediatric consult.

1. Approach to the management of hyperbilirubinemia in term newborn infants. Canadian Pediatric Society Fetus and Newborn Committee. Peciatr Chil Health 1999; 4: 161-164.
2. Adapted from American Academy of Pediatrics. Clinical Practice Guideline: management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. Pediatrics 2004; 114: 297-316.

PHOTOTHERAPY

Old Standard of Practice

‘Single’, ‘double’ and ‘triple’ phototherapy may no longer be ordered by the physicians and midwives.

New Standard of Practice

New standards for phototherapy require all babies to receive ***intensive phototherapy***.

Intensive phototherapy is defined as ‘the use of high levels of irradiance, usually 30 μW/cm2/nm or higher, delivered to as much of the infant’s skin surface area as possible.

How will effective, intensive phototherapy be delivered?:

On MUMC Ward 4C:

⇒ babies who require phototherapy will be placed in an isolette to receive phototherapy via the Biliblanket Plus (delivers 57 μW/cm2/nm) and 1 set of Microlights (delivers 12 – 15 μW/cm2/nm).

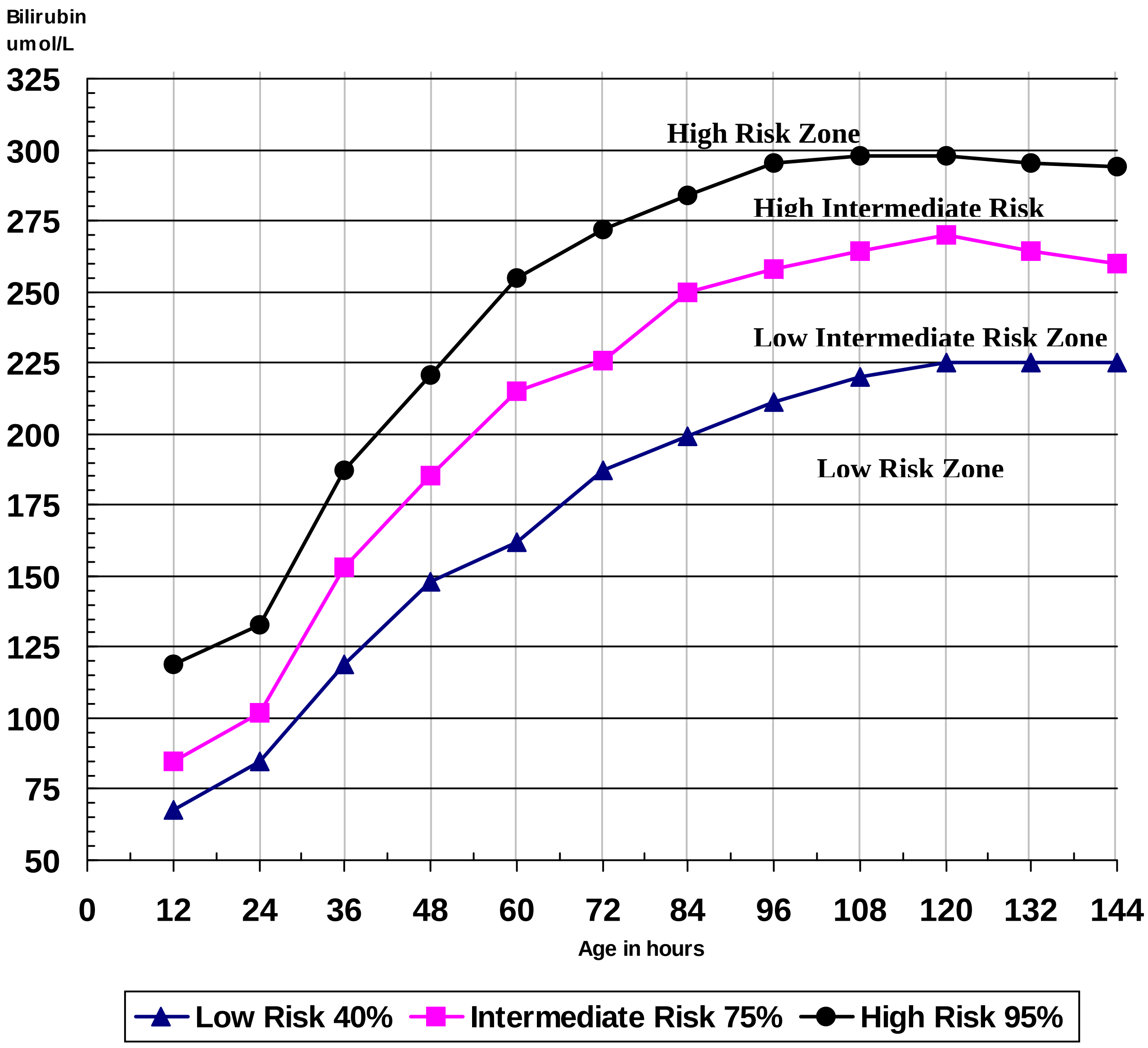
On St. Joe’s Ward 3OBS:

⇒ babies who require phototherapy will be placed in an isolette to receive phototherapy via two sets of Microlights (deliver 12 - 15 μW/cm2/nm each).

It is recommended that babies whose TSBs do not decrease within 4-6 hours once intensive phototherapy has been initiated receive a Pediatric consult.

Total Serum Bilirubin Screening Assessment Nomogram

Always consider bilirubin level by the infant's age in hours



Adapted from American Academy of Pediatrics, Clinical Practice Guideline: Management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. Pediatrics 2004;114:297-316

How to Use the Total Serum Bilirubin <u>Screening</u> Assessment Nomogram

- Plot the TSB result on this nomogram, then refer to TSB Screening Response Table for action to be taken (see next page).

It is recommended that either a TSB or TcB***** (Transcutaneous Bilirubin) concentration be measured in all infants between 24 h and 72 h of life. If the infant does not require immediate treatment, the results should be plotted on the predictive (screening) nomogram to determine the risk of progression to severe hyperbilirubinemia. If the infant has not been measured earlier because of clinical jaundice, a TSB measurement should be obtained at the same time as the Newborn Screening test.

* At the present time, neither McMaster nor St. Joseph's has a reliable Transcutaneous Bilirubin meter which accurately and consistently measures serum bilirubin levels.

Canadian Paediatric Society. Guidelines for detection, management and prevention of hyperbilirubinemia in term and late preterm newborn infants (35 or more weeks' gestation). Fetus and Newborn Committee, Canadian Pediatric Society (CPS), Pediatrics and Child Health 2007; 12(5): 1B-12B.

RESPONSE TO RESULTS OF TOTAL SERUM BILIRUBIN SCREENING

35 – 37 6/7 Weeks Gestation

Bilirubin Screening Responses– 35 to 37 6/7 weeks gestation		
Bilirubin Risk Zone @ time of screening	35 – 37 6/7 weeks gestation with a NEGATIVE Coombs	35 – 37 6/7 weeks gestation with a POSITIVE Coombs
Low Risk Zone	Routine care No Coombs test required ☐	Routine care No Coombs test required ☐
Low-Intermediate Risk Zone	Routine care ☐	Further testing or treatment required ☐
High-Intermediate Risk Zone	Follow-up assessment including TSB at 24 to 48 h ☐	Further testing or treatment required ☐
High Risk Zone	Further testing or treatment required ☐	Phototherapy required ☐
	TSB results in all shaded zones require Coombs test to be done if mother is Blood Group O*	

Mother's Blood Group:
☐ O ☐ Other

Coombs Test Ordered:
☐ Yes ☐ No

Coombs Test (DAT):
☐ +ve ☐ -ve

↑ Refer to Coombs Test Algorithm ↓

38 Weeks Gestation

Bilirubin Screening Responses– greater than or equal to 38 weeks gestation		
Bilirubin Risk Zone @ time of screening	Greater than or equal to 38 weeks gestation with a NEGATIVE Coombs	Greater than or equal to 38 weeks gestation with a POSITIVE Coombs
Low Risk Zone	Routine care No Coombs test required ☐	Routine care No Coombs test required ☐
Low-Intermediate Risk Zone	Routine care No Coombs test required ☐	Routine care No Coombs test required ☐
High-Intermediate Risk Zone	Routine care - care provider consider a follow-up TSB if there is clinical concern ☐	Follow-up assessment including TSB at 24 to 48 h ☐
High Risk Zone	Further testing or treatment required ☐	Further testing or treatment required ☐
	TSB results in all shaded zones require Coombs test to be done if mother is Blood Group O*	

Mother's Blood Group:
☐ O ☐ Other

Coombs Test Ordered:
☐ Yes ☐ No

Coombs Test (DAT):
☐ +ve ☐ -ve

*Although it is highly unlikely, it is reasonable to perform a Coombs test in infants of mothers who are not Blood Group O and whose TSB results are in the High-Intermediate Risk Zone or the High Risk Zone

Routine Care - Follow-up appointment within 48 hours after discharge with MD or MW if infant is greater than 48 hours of age on discharge, or

- Follow-up appointment within 24 hours after discharge with MD or MW if infant is less than 48 hours of age on discharge

If the baby is in the **LRZ** or **LIZ** risk zone and there is no clinical concern, then the TSB result does not need to be reported to the MD/MW and the baby may be discharged as per **Routine Care** outlined above.

Follow-up assessment including TSB at 24 to 48 h:

– Follow-up assessment: babies require appointment with MD, MW or BANA within 24 - 48 hours of discharge, AND

- Follow-up TSB at 24 to 48 h:

  In region: all babies requiring pre-ordered bloodwork should have appointment booked in BANA

  Out of region: all babies requiring pre-ordered bloodwork may have an appointment booked in BANA or an outpatient clinic in their community.

Further testing or treatment – a repeat TSB should be done or intensive phototherapy should be initiated as per MD / MW order

BANA = Breastfeeding and Newborn Assessment Clinic

HYPERBILIRUBINEMIA - COOMBS TEST ALGORITHM

When a Coombs test needs to be done as part of the newborn hyperbilirubinemia assessment, please follow the algorithm below based upon the mother's blood group:

MOTHER O -ve

Babies of all Rh negative mothers will automatically have their blood group done at time of birth by Transfusion Medicine Lab to determine if mother needs another dose of Rh immune globulin.

- Baby O –ve or O +ve → Coombs Test **IS NOT** required
- Baby A* or B* → Coombs Test **IS** required

MOTHER O +ve

When the Transfusion Medicine Lab receives an order to do a Coombs test, the Lab will do the baby's blood group first.

- Baby O –ve or O +ve → Coombs Test **IS NOT** required
- Baby A* or B* → Coombs Test **IS** required

MOTHER A* or B*

Coombs Test **IS NOT** required.

*A = A +ve and A –ve B = B+ve and B -ve

NOTE:

If <u>any</u> antibodies are detected prenatally, then a Coombs' test must always be done regardless of mother's and baby's blood types.

UNIVERSAL SCREENING FOR TOTAL SERUM BILIRUBIN

The institution of a program of universal screening compliments, but does not replace, careful ongoing assessment of newborn infants beginning from the first hours of life and continuing through the first weeks. All infants should be clinically assessed for jaundice repeatedly within the first 24 h, and again, at a minimum, 24 h to 48 h later whether in hospital or after discharge. Systems to ensure follow-up within the recommended intervals after hospital discharge must be in place so that an infant who develops severe hyperbilirubinemia can be identified and treated promptly by an individual with the training to recognize neonatal hyperbilirubinemia, obtain measurement of TSB or TcB without delay and refer the infant to a treatment facility if required. This individual may be from any medical or nursing discipline. (CPS, June 2007).

1) Universal screening applies to all babies 35 or more weeks gestation in all nursery and neonatal units at both St. Joseph's and McMaster hospitals.

2) If the TSB had not been measured earlier because of clinical jaundice, a TSB measurement should be obtained at the time of the Newborn Screening test to avoid an increase in the number of painful procedures for the infant (when the Newborn Screening test is done after 24 hours of age).

3) If a baby is being discharged at less than 24 hours of age, a TSB measurement would be inadequate (if done before 24 hours of age) to predict the risk of progression to severe hyperbilirubinemia. The CPS guidelines recommend that all babies have a TSB test between 24 – 72 hours of age. If the baby is discharged before 24 h of age, the TSB blood test should be discussed with the baby's ongoing health care provider at his/her first visit post-discharge.

4) Staff must refer to both the Phototherapy Nomogram and the Screening Assessment Nomogram each time they view a TSB result. Staff must check each TSB result:
   - to determine if the baby is above or below the phototherapy treatment line
   - to determine which risk zone the baby's TSB result falls into for screening (and possible Coombs test) and discharge follow-up

   If the infant does not require immediate treatment (intensive phototherapy), the TSB result should be plotted on the Screening Assessment Nomogram form to determine the risk of progression to severe hyperbilirubinemia (ie. which risk zone the baby is in).

Adapted from American Academy of Pediatrics. Clinical Practice Guideline: management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. Pediatrics 2004; 114: 297-316.

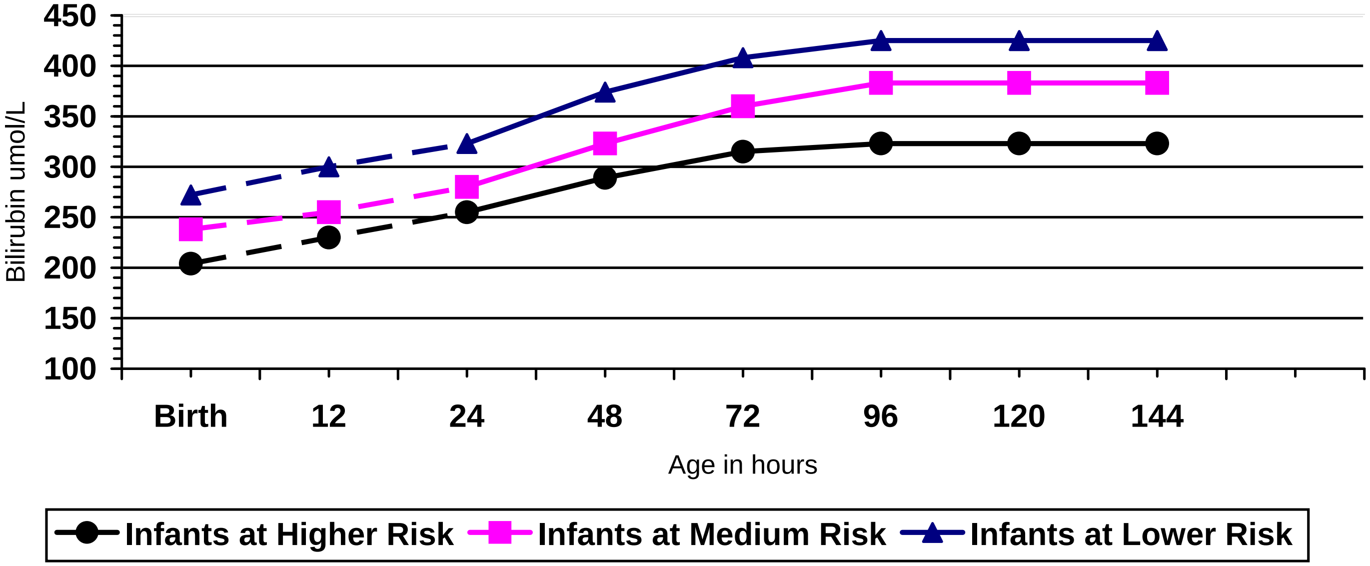
Alkalay, A.L. et al. Hyperbilirubinemia Guidelines in Newborn Infants. Pediatrics 2005; 115: 824-825.

Canadian Paediatric Society. Guidelines for detection, management and prevention of hyperbilirubinemia in term and late preterm newborn infants (35 or more weeks' gestation). Fetus and Newborn Committee, Canadian Pediatric Society (CPS), Pediatrics and Child Health 2007; 12(5): 1B-12B.

This nomogram is for use by Pediatricians and Neonatologists but may be used as a reference guide by Family Physicians and Midwives.

Guidelines for Exchange Transfusion *in Infants 35 or More Weeks' of Gestation*

Bilirubin Nomogram for Exchange Transfusion



Guidelines:
The dashed lines for the first 24 hours indicate uncertainty due to wide range of clinical circumstances and a range of responses to phototherapy.

Infants at Low Risk: ≥38 weeks with no risk factors
Infants at Medium Risk: ≥38 weeks with risk factors or 35-37 6/7 weeks with no risk factors
Infants at Higher Risk: 35-37 6/7 weeks with risk factors

Risk Factors:

- hemolysis due to maternal isoimmunization, G6PD deficiency, pyruvate kinase deficiency, congenital spherocytosis or other causes of hemolysis
- sepsis, temperature instability, significant lethargy
- need for resuscitation at birth/asphyxia
- evidence of metabolic or respiratory acidosis
- low serum albumin<30g/L

⇒ These exchange levels represent a consensus but are based on limited clinical evidence.
⇒ Exchange transfusion is recommended if the total serum bilirubin rises to these levels despite intensive phototherapy for 6 hours. Repeat serum bilirubin every 2 to 3 hours during intensive phototherapy.
⇒ Immediate exchange transfusion is recommended if the total serum bilirubin is 85 μmol/L above these lines or if the infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocolis, opisthotonus, fever, high pitched cry).
⇒ Consider exchange transfusion if the cord bilirubin is >85 μmol/L and the Hb<120g/L.
⇒ Measure serum bilirubin and calculate the bilirubin/albumin ratio (B/A ratio). The B/A ratios can be used together with but not in lieu of the serum bilirubin level as an additional factor in determining the need for exchange transfusion.

IgG treatment for babies with immune hemolytic jaundice approaching exchange: Infants with a positive DAT who have predicted severe disease based on antenatal investigation or an elevated risk of progressing to exchange transfusion based on postnatal progression of TSB concentrations should receive IVIG at a dose of 1 g/kg. (CPS, 2007)

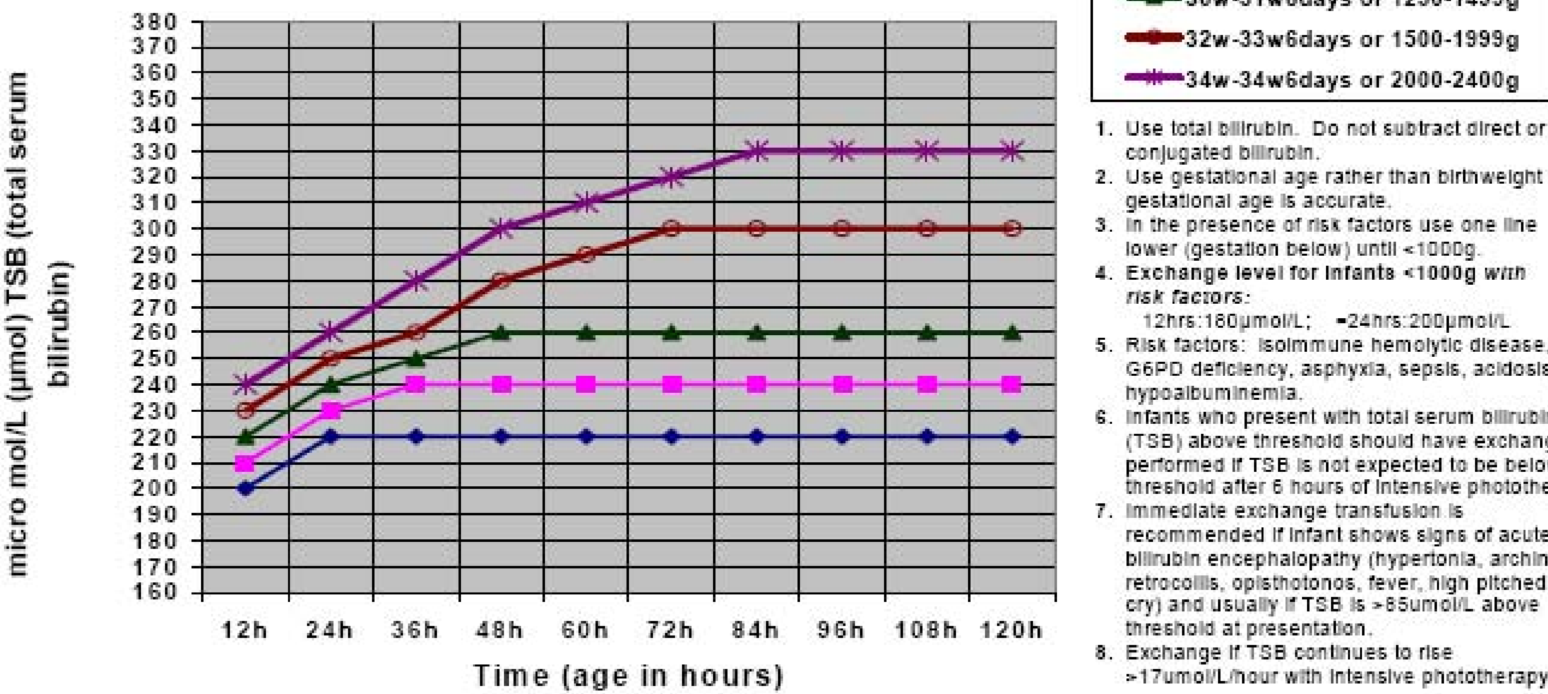
KEY RECOMMENDATIONS FOR PREVENTING AND MANAGING HYPERBILIRUBINEMIA

1. Promote and support successful breastfeeding.
2. Establish nursery protocols for the jaundiced newborn and permit nurses to obtainTSB levels without a physician's order. St. Joseph's Healthcare and McMaster will implement a universal TSB screening program.
3. Measure the TSB or TcB* (Transcutaneous Bilimeter) concentrations of infants jaundiced in the first 24 h after birth

*** At the present time, neither McMaster nor St. Joseph's has a reliable Transcutaneous Bilirubin meter which accurately and consistently measures serum bilirubin levels.**

4. Recognize that visual diagnosis of jaundice is unreliable, particularly in darkly pigmented infants.
5. Interpret all TSB (Total Serum Bilirubin) levels according to the infant's age in hours, not days.
6. Do not treat a near-term (35 to 38 wk) infant as a term infant; a near-term infant is at much higher risk of hyperbilirubinemia.
7. Perform a pre-discharge systematic assessment on all infants for the risk of severe hyperbilirubinemia.
8. Provide parents with information about newborn jaundice.
9. Provide follow-up based on the time of discharge and the risk assessment.
10. When indicated, treat the newborn with phototherapy or exchange transfusion.

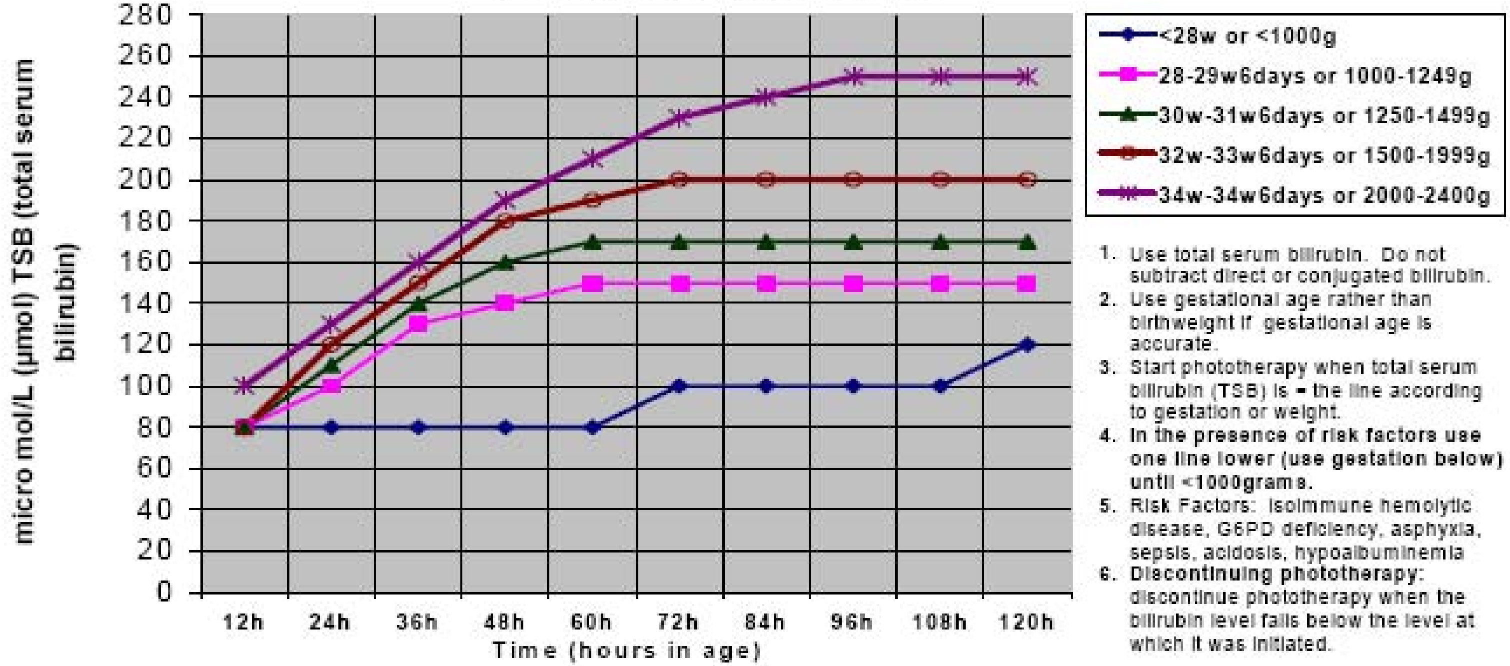
The Hospital for Sick Children Exchange Transfusion for Infants <2500g and/or <35weeks gestation



1. Use total bilirubin. Do not subtract direct or conjugated bilirubin.
2. Use gestational age rather than birthweight if gestational age is accurate.
3. In the presence of risk factors use one line lower (gestation below) until <1000g.
4. **Exchange level for infants <1000g *with risk factors:***
   12hrs:180µmol/L; ≥24hrs:200µmol/L
5. Risk factors: isoimmune hemolytic disease, G6PD deficiency, asphyxia, sepsis, acidosis, hypoalbuminemia.
6. Infants who present with total serum bilirubin (TSB) above threshold should have exchange performed if TSB is not expected to be below the threshold after 6 hours of intensive phototherapy.
7. Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonos, fever, high pitched cry) and usually if TSB is >85umol/L above threshold at presentation.
8. Exchange if TSB continues to rise >17umol/L/hour with intensive phototherapy.

References
1. Horn AR et al. Phototherapy and exchange transfusion for neonatal hyperbilirubineaemia: neonatal academic hospitals consensus guidelines for South African hospitals and primary care facilities. S Afr Med J. 2005 Sep;96(9): 819-24.
2. Maisels, MJ, Watchko JF. Treatment of jaundice in low birthweight infants. Arch Dis Child Fetal Neonatal Ed. 2003;88;F459-463.
3. Morris et al. Aggressive vs conservative phototherapy for infants with extremely low birth weight. N Engl J Med 2008; 359:1885-96.

The Hospital for Sick Children
Phototherapy Guidelines for Infants
<35 weeks and/or <2500g



1. Use total serum bilirubin. Do not subtract direct or conjugated bilirubin.
2. Use gestational age rather than birthweight if gestational age is accurate.
3. Start phototherapy when total serum bilirubin (TSB) is = the line according to gestation or weight.
4. **In the presence of risk factors use one line lower (use gestation below) until <1000grams.**
5. Risk Factors: Isoimmune hemolytic disease, G6PD deficiency, asphyxia, sepsis, acidosis, hypoalbuminemia
6. **Discontinuing phototherapy:** discontinue phototherapy when the bilirubin level falls below the level at which it was initiated.

References

1. Horn AR et al. Phototherapy and exchange transfusion for neonatal hyperbilirubineaemia: neonatal academic hospitals consensus guidelines for South African hospitals and primary care facilities. S Afr Med J. 2005 Sep;96(9): 819-24.
2. Maisels, MJ, Watchko JF. Treatment of jaundice in low birthweight infants. Arch Dis Child Fetal Neonatal Ed. 2003;88;F459-463.
3. Morris et al. Aggressive vs conservative phototherapy for infants with extremely low birth weight. N Engl J Med 2008; 359:1885-96.

PEDIATRIC FORMULARY

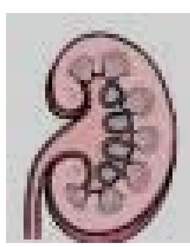
ABBREVIATION (ABB.) GUIDELINES

Hamilton Health Sciences Corporation - *June 2005*

OLD ABB. DO NOT USE	NEW ABB. TO BE USED
U	Unit
S. C.	Subcutaneous or subcut
Cc	ml or mL
Mg	microgram or mcg
MS	Morphine or morphine sulphate
$MgSO_4$	Magnesium Sulphate
10.0 mg	10 mg (***delete "trailing" zero***)
.1 mg	0.1 mg (***add "leading zero***)
q.d/o.d	Write ***daily*** out in full
>	Write out ***greater than*** in full
<	Write out ***less than*** in full
@	Write out ***at*** in full
O.S, O.D., O.U	Write out ***left eye***, ***right eye*** or ***both eyes*** in full
A.S., A.D., A.U.	Write out ***left ear***, ***right ear*** or ***both ears*** in full

Legend:

GP Gram Positive
GPC Gram Positive Cocci
GN Gram Negative
GNB Gram Negative Bacilli
MAX Maximum
MIN Minimum
NF Non-Formulary At HHS



Adjust dosing interval for patients with renal impairment.

Safer Order Writing

In both critical care and pediatrics there is a high potential for medication errors and due to both the nature of the patients and the medications involved the consequences of any errors may catastrophic.

Some rules intended to reduce the potential for medication errors:

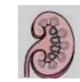
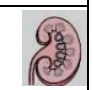
- Write orders clearly and concisely.
- Use generic drug names only.
- Be careful with mg/kg/DAY vs mg/kg/DOSE.
- Include the intended dose per kilogram on each order.
- Write the patients weight on each order sheet.
- Never place a decimal and a zero after a whole number (4.0 mg should be 4 mg) and always place a zero in front of a decimal point (.2mg should be 0.2 mg). The decimal point has been missed and tenfold overdoses have been given.
- Never abbreviate the word unit. The letter U has been misinterpreted as a 0, resulting in a 10 fold overdose.
- Always order medications as mg, not mL as different concentrations may exist of a given medication. There are a few exceptions such as co-trimoxazole (Septra®).
- QD is not an appropriate abbreviation for once daily, it has been misinterpreted as QID. It is best to write out “once daily” or “q24h.”
- Do not abbreviate drug names (levo, 6MP, MSO4, MgSO4, HCTZ).
- Do not abbreviate microgram to μg, use mcg, or even safer, write out microgram or use milligrams if possible (0.25 mg instead of 250 micrograms)

ANTIBACTERIALS

CELL WALL SYNTHESIS INHIBITORS (BACTERICIDAL)

β-LACTAMS

PENICILLINS

benzyl penicillin: narrow spectrum; NOT Penicillinase resistant	
Penicillin G (IV or IM) **Penicillin V** (PO)	<u>Moderate to Severe Infections</u>: IV: 100 000 - 400 000 Units/kg/day ÷ q4-6h (MAX: 20 million Units/day) <u>Meningitis</u>: IV: 400 000 Units/kg/day ÷ q4h (MAX: 20 million Units/day) 
isoxazoyl penicillin: narrow spectrum; Penicillinase resistant	
Cloxacillin (IV or PO)	<u>Primarily used in Staphylococcal infections</u>: IV: 100-200 mg/kg/day ÷ q6h (MAX: 8 g/day) PO: 25-50 mg/kg/day ÷ q6h (MAX: 500 mg/dose) Higher oral doses are poorly tolerated, usually use Cephalexin (1^{st} Gen^{n} Cephlasporin)
Aminopenicillin: broad spectrum; Penicillinase sensitive	
Ampicillin (IV)	<u>Meningitis</u>: IV: 200 mg/kg/day ÷ q6h (MAX: 2 g/dose) Note: doses of 400 mg/kg/day have been used for Meningitis <u>Other infections:</u> IV: 100-200 mg/kg/day ÷ q6h (MAX: 2 g/dose) 
Amoxicillin (PO)	<u>Standard dose</u>: PO: 40-50 mg/kg/day ÷ q8h <u>High dose</u>: PO: 80-90 mg/kg/day ÷ q8h (MAX: 1 g/dose) (resistant organisms, AOM) <u>Severe infections and Suspected Penicillin Resistant S. pneumoniae</u>: PO: doses up to 100 mg/kg/day (MAX: 1 g/dose) have been tolerated
Clavulanic Acid: Enhances spectrum; Penicillinase inhibitor	
Amoxicillin + Clavulanic Acid (Clavulin) (PO)	<u>Active against GP, GN and anaerobic organisms:</u> PO: 25-40 mg/kg/day of amoxicillin component ÷ q8h (MAX: 500 mg/dose)

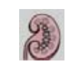
ANTIBACTERIALS (CONTINUED)

PENICILLINS (CONTINUED)	
Ureidopenicillin: broad spectrum; Penicillinase sensitive	*Tazobactam: Enhances spectrum; β-lactamase inhibitor*
Piperacillin (IV)	<u>Active against GP (including S. aureus), Pseudomonas aeruginosa, GN and anaerobes (eg. Bacteroides fragilis):</u> IV: 200-300 mg/kg/day ÷ q6h (MAX: 16 g/day)
Piperacillin + Tazobactam (IV)	IV: 200-300 mg/kg/day (of Piperacillin component) ÷ q6-8h (MAX: 16 g/day dose is 4.5 g [4 g Piperacillin + 0.5 g Tazobactam] q8h) Order tazobactam (as x mg (or g) of piperacillin component) IV q8h
CEPHALOSPORINS	
1st Generation	GPC (except MRSA and Enterococci) GNB (mainly E. coli, Klebsiella, Proteus)
Cefazolin (Ancef) (IV or IM)	IV: 75-150 mg/kg/day ÷ q8h (MAX: 6 g/day
Cephalexin (Keflex) (PO)	PO: 25-50 mg/kg/day ÷ qid <u>Severe infections:</u> can give 100 mg/kg/day (MAX: 4 g/day)
2nd Generation	Less GP more GN than 1st Generation (H. influenzae, E. coli, Klebsiella, Proteus) Anaerobic activity, thus used in intra-abdominal and pelvic infections
Cefuroxime (Kefurox) (IV or IM)	<u>Epiglottitis or Facial cellulitis:</u> IV: 150 mg/kg/day ÷ q8h (MAX: 1.5 g/dose) <u>Other infections:</u> IV: 75-150 mg/kg/day ÷ q8h (MAX: 750 mg/dose)
Cefuroxime Axetil (Ceftin) (PO)	PO: 20-30 mg/kg/day ÷ bid (MAX: 1 g/day), NF
Cefprozil (Cefzil) (PO)	PO: 30 mg/kg/day ÷ q12h (MAX: 1 g/day).
Cefotetan (Cefotan)	<u>Anaerobic organisms</u>: IV: 60 mg/kg/day ÷ q12h (MAX: 6 g/day)
Cefoxitin (IV or IM)	<u>Anaerobic organisms</u>: IV: 80-160 mg/kg/day ÷ q8h (MAX: 8 g/day)
Cefaclor (Ceclor) (PO)	PO: 20-40 mg/kg/day ÷ q8h (MAX: 1.5 g/day)

ANTIBACTERIALS (CONTINUED)

CEPHALOSPORINS	
3rd Generation	Broad spectrum activity against enteric GN, less GP coverage than 1st Generation Crosses Blood-Brain-Barrier unlike 1st and 2nd Generations
Cefotaxime (IV or IM)	Meningitis: IV: 200 mg/kg/day ÷ q6h (MAX: 8 g/day) Other infections (Not active against Pseudomonas aeruginosa): IV: 100-200 mg/kg/day ÷ q8h (MAX: 6 g/day) 
Ceftazidime (IV or IM)	Active against Pseudomonas aeruginosa: IV: 75-150 mg/kg/day ÷ q8h (MAX: 6 g/day) 
Ceftriaxone (IV or IM)	Meningitis: IV/IM: 80 mg/kg/dose q12 hours x 3 doses then q24h (MAX: 2 g/dose) IV/IM: 50-75 mg/kg q24h (MAX: 2 g/day) Restricted at HHS to patients without IV access, otherwise use cefotaxime
Cefixime (Suprax) (PO)	Uncomplicated Cervical or Urethral Gonorrhea: PO: 400 mg once (minimum weight 45 kg) Other infections (Not active against Pseudomonas or S. aureus): PO: 8 mg/kg/day ÷ q12-24h (MAX: 400 mg/day) Restricted at HHS to treatment of STDs
GLYCOPEPTIDES	Only active against GP; True major penicillin allergic patients
Vancomycin (IV or PO)	Meningitis: IV: 60 mg/kg/day ÷ q6h (MAX: 4 g/day) Other infections (MRSA or Coagulase Negative Staphylococci): IV: 40 mg/kg/day ÷ q6-12h (MAX: 2 g/day) Pseudomembranous Colitis Refractory to Metronidazole: PO: 50 mg/kg/day ÷ q6h (MAX: 500 mg/day) Infuse over at least 1 hour to avoid Red Man Syndrome; If reaction, increase infusion time Monitor trough levels in patients with septic shock, concurrent nephrotoxins, fluctuating renal function or extended treatment courses 

ANTIBACTERIALS (CONTINUED)

Protein Synthesis Inhibitors	
VIA 50S Ribosome (Bacteriostatic)	
MACROLIDES	Atypicals: Mycoplasma, Legionella, Chlamydia, Treponema, H. pylori GPC: streptococcal infections in patients allergic to penicillin UTI, Community Acquire Pneumonia as outpatient
Erythromycin	IV: 25-50 mg/kg/day ÷ q6h (MAX: 4 g/day) PO: 20-40 mg/kg/day ÷ q6h (MAX: 2 g/day) GI adverse effects common, even with IV use. Thrombophlebitis common. Rx Interactions: ↑ levels of midazolam, carbamazepine, theophylline, cyclosporine, phenytoin
Clarithromycin	Rx Interactions: theophylline, carbamazepine, cisapride, digoxin, cyclosporine, tacrolimus. 
Azithromycin	PO/IV: 10 mg/kg (MAX: 500 mg) once, then 5 mg/kg (MAX: 250 mg) q24h for 4 days/doses For serious infections may give 10 mg/kg q24h for 4 days or doses <u>Chlamydial infection (non-gonococcal urethritis or cervicitis):</u> PO: 1 g once (MIN weight 45 kg)
LINCOSAMIDES	GP and Anaerobic infections (B. fragilis, C. perfringens)
Clindamycin	IV: 30-40 mg/kg/day ÷ q8h (MAX: 900 mg/dose) PO: 10-20 mg/kg/day ÷ q6-8h (MAX: 450 mg/dose) May potentate muscle weakness with neuromuscular blockers. Oral suspension is very poorly tolerated, avoid if possible, use 150 mg capsules or an alternative antibiotic

ANTIBACTERIALS (CONTINUED)

VIA 30S Ribosome (Bacteriostatic)

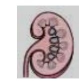
AMINOGLYCOSIDES

GN Aerobes + Mycobacteria; Tobramycin for Pseudomonas
Requires oxygen for uptake therefore ineffective against anaerobes

Gentamicin

IV: 5-6 mg/kg/dose **q24h** or 2.5 mg/kg/dose **q8h**

Once daily dosing should be used for all patients > 1 month of age, except in the treatment of endocarditis and in patients with extensive burns. Ototoxicity and nephrotoxicity may occur, consider monitoring trough levels (target <2 mg/L) in patients at risk for nephrotoxicity; septic shock, concurrent nephrotoxins, fluctuating renal function or extended treatment courses. May potentiate muscle weakness with neuromuscular blockers



Folic Acid Metabolism Inhibitors (Bacteriostatic)

TRIMETHOPRIM-SULFAMETHOXAZOLE (TMP-SMX) (Septra, Co-trimoxazole)
SMX alone: Norcardia
Combo: Pneumocystis carinii, Toxoplasma, Shigella, Salmonella

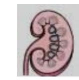


Bacterial infections (UTI):
PO/IV: 8 mg/kg/day (of Trimethoprim component) ÷ q12h
Pneumocystis carinii pneumonia (PCP):
PO/IV: 20 mg/kg/day (of Trimethoprim component) ÷ q6h
If PCP is severe (i.e. hypoxia), consider adding Methylprednisolone 1 mg/kg q24h
Order in mL of suspension or injection or number of tablets:

	Trimethoprim	Sulfamethoxazole
Suspension	8 mg/ml	40 mg/ml
Injection	16 mg/ml	80 mg/ml
Tablet	80 mg	400 mg
DS Tablet	160 mg	800 mg

Excellent oral absorption, use IV only if PO contraindicated. Maintain good fluid intake and urine output. Monitor CBC and LFTs. Do not use in patients with G-6-PD deficiency.

ANTIBACTERIALS (CONTINUED)

DNA Gyrase Inhibitors (Bactericidal)	
QUINOLONES	Enteric GNB; Pseudomonas aeruginosa. Ciprofloxacin has been used in pediatrics but the association between ciprofloxacin and the development of arthropathy in humans is still controversial
Ciprofloxacin (IV or PO)	IV/PO: 20-30 mg/kg/day ÷ q12h (MAX: 400 mg/dose IV or 750 mg/dose PO) Excellent oral absorption, use IV only if PO contraindicated. Feeds, formula, calcium, magnesium, iron, antacids and sulcralfate reduce absorption, hold feeds for 1 hour before and 2 hours after dose. 
DNA Complex Damaging Agents (Bactericidal)	
METRONIDAZOLE (IV or PO)	
<u>Anerobic infections:</u> IV/PO: 20-30 mg/kg/day ÷ q12h (MAX: 1 g/day) <u>C. difficile (For Colitis)</u>: (Enteral administration preferred but IV can be used) IV/PO: 30 mg/kg/day ÷ q6-8h (MAX: 1.5 g/day) Excellent oral absorption, use IV only if PO contraindicated or not tolerated	
ANTIFUNGALS	
Fluconazole (IV or PO)	<u>Oropharyngeal candidiasis</u>: IV/PO: 3 mg/kg q24h <u>Esophageal candidiasis:</u> IV/PO: 6 mg/kg q24h (MAX: 400 mg/day) <u>Candidemia</u>: IV/PO: 12 mg/kg once (MAX: 800 mg) Then 6 mg/kg/day (MAX: 400 mg/day, ↑ doses used) Excellent oral absorption, use IV only if PO contraindicated. May increase serum levels of cyclosporine, midazolam, cisapride, phenytoin. Aspergillus species and Candida krusei are intrinsically resistant, Candida glabrata may respond to higher doses. 
Nystatin (Topical)	<u>Oral candadiasis</u>: PO: infants: 100 000 Units swish and swallow q6h children: 250 000 Units swish and swallow q6h adolescents: 500 000 Units swish and swallow q6h

PEDIATRIC FORMULARY

Acetaminophen

Analgesic and antipyretic.

PO/PR: 40-60 mg/kg/day ÷ q4-6h (maximum 60 mg/kg or 4 g/day).

A single dose greater than 150 mg/kg is generally considered to be toxic, but toxicity has been reported at lower doses (90-120 mg/kg/day). Rectal absorption may be erratic, consider increasing dose by approximately 20%.

1 microgram/mL = 6.62 micromol/mL.

Weight (kg)	Single Dose (mg)
2.5 - 3.9	40
4.0 - 5.4	60
5.5 - 7.9	80
8.0 - 10.9	120
11.0 - 15.9	160
16.0 - 21.9	240
22.0 - 26.9	320
27.0 - 31.9	400
32.0 - 43.9	480
44 – over	650

Acetylsalicylic Acid

Antiplatelet:

PO: 5 mg/kg/dose q24h.
Minimum 20 mg, usual maximum 80 or 325 mg.

Kawasaki disease:

PO: 80-100 mg/kg/day ÷ q6h, reduce dose to 3-5 mg/kg q24h once fever resolves.

Supplied as 80 mg chewable tablets and 325 and 650 mg tablets.

Captopril

Angiotensin converting enzyme inhibitor.

PO: 0.1-0.3 mg/kg/dose q8h initially
(usual maximum 6 mg/kg/day or 200 mg/day).

Monitor blood pressure closely after first dose, may cause profound hypotension.

Carbamazepine

Anticonvulsant.

PO: 10-20 mg/kg/day initially, usual maintenance dose is 20-30 mg/kg/day. Divide daily dose q8-12h.

Serum trough concentration target is 17-51 micromol/L (4-12 microgram/mL).

Charcoal

Adsorbent used in toxic ingestions.

PO: 1-2 g/kg once.

PO: Multiple dose therapy 0.5 g/kg q4-6h.

Give via NG if necessary, consider antiemetics.

Chloral Hydrate

Sedative and hypnotic.

<u>Procedural Sedation:</u>

PO/PR: 80 mg/kg, may repeat half dose if no effect in 30 minutes (maximum 2 g/dose).

<u>Sedation:</u>

PO/PR: 25-50 mg/kg/dose (maximum 500 mg q6h or 1 g hs).

Avoid in liver dysfunction. Tolerance develops and withdrawal may occur after long-term use. For PR use dilute syrup with water.

Codeine

Opiate analgesic used to treat mild-moderate pain.

PO/IM/SC: 0.5-1 mg/kg q4h prn (maximum 60 mg/dose).

Not for IV use due to significant histamine release and possible cardiovascular side effects. Not commonly used in ICU setting.

Morphine is the preferred oral opiate for the treatment of acute pain

Morphine has important effectiveness and safety advantages and is preferred over codeine (which historically had been the most commonly used oral opiate at McMaster Children's Hospital). Codeine is a weak opiate analgesic with minimal intrinsic analgesic activity; it must first be metabolized to morphine which provides most of the analgesic effect. Because of the need for metabolism:

- Codeine has variable efficacy. Up to 10% of the population does not effectively metabolize codeine to morphine, resulting in poor pain control.
- Codeine has caused toxicity (including deaths) due to high levels of morphine in ultra-rapid metabolizers (up to 40% in some populations).

- Codeine has a higher potential for drug interactions than other opiates that may result in either reduced effectiveness or increased levels of morphine.

To avoid the unpredictably variable analgesia and potential for toxicity, a simpler approach is to use morphine.

Dexamethasone

Corticosteroid.

Croup:

IV/IM/PO: 0.6 mg/kg once.

Meningitis:

IV: 0.15 mg/kg/dose q6h for 4 days.
Begin with first antibiotic dose.

Prevention of post-extubation stridor:

IV: 0.25-0.5 mg/kg/dose (maximum 10 mg/dose) q6h x 6 doses.
Begin 24 hours pre-extubation if possible.

Increased ICP due to space occupying lesion:

IV/PO: 0.2-0.4 mg/kg initially followed by
0.3 mg/kg/day ÷ q6h.

Discontinuation of therapy >14 days requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy. Prolonged weakness may occur when corticosteroids are used concurrently with non-depolarizing neuromuscular blocking agents.

Dextrose

Treatment of hypoglycemia:

IV: 0.5-1 g/kg/dose:
1-2 mL/kg of 50% dextrose
5-10 mL/kg of 10% dextrose

1 mmol of dextrose (0.2 g of dextrose) provides 2.8 kJ (0.67 kcal).

Diazepam

Benzodiazepine sedative, anxiolytic and amnestic.

Status epilepticus:

IV: 0.25 mg/kg/dose (maximum 5 mg, 10 mg for older children).

PR: 0.5 mg/kg/dose (maximum 20 mg/dose).

ICU sedation:

IV: 0.1-0.3 mg/kg q1h prn.

Fast onset and short duration of action with single doses, duration of action prolonged with continued use. Not first line drug for ICU sedation due to short duration of action and the potential for accumulation. Withdrawal may occur if discontinued abruptly after prolonged use. Not recommended for continuous infusion due to poor solubility. Can give parenteral preparation rectally, diluted with water.

Dimenhydrinate (Gravol)

Antihistamine used to treat nausea and vomiting.

IV/IM/PO: 1 mg/kg/dose q4-6h (maximum 50 mg/dose).

Diphenhydramine (Benadryl)

Antihistamine used primarily to treat urticaria.

IV/IM/PO: 0.5-1 mg/kg/dose q6h (maximum 50 mg/dose).

Domperidone

Prokinetic agent.

PO: 1.2-2.4 mg/kg/day ÷ q6h (maximum 80 mg/day).

Enoxaparin

Anticoagulant, low-molecular weight heparin.

Treatment:

SC: <2 months of age: 1.5 mg/kg/dose q12h.

>2 months of age: 1 mg/kg/dose q12h.

Prophylaxis:

SC: <2 months of age: 0.75 mg/kg/dose q12h.

>2 months of age: 0.5 mg/kg/dose q12h.

Monitor platelets and hemoglobin. Avoid in severe renal dysfunction. Anti-factor Xa level drawn 4 hours post SC injection should be 0.5-1 unit/mL for treatment and 0.2-0.4 unit/mL for prophylaxis.

Epinephrine (Racemic)

Post-extubation stridor/croup: Use 1:1000 epinephrine(racemic 2.25% not available)

Patient Age	**Patient Weight**	**Volume (mL) epinephrine 1:1000** Note 1 mL = 1 mg	**Volume of preservative-free saline**
Less than 1 year	Plus less than 5 kg	0.5 mL/kg	Add saline to give total of 2 to 3 mL total volume for nebulization
Less than 1 year	Greater than or 5 kg	2.5 mL	0.5 mL saline to total volume of 3 mL
1 year or older	Greater than 5 kg	5 mL	Do not dilute with saline

Ferrous Sulfate : See iron.

Fluticasone (Flovent)

Inhaled corticosteroid.

INH: 125-500 microgram q12h.

Higher doses may be required if administered through a ventilator due to loss of drug in the circuit.

Furosemide

Loop diuretic.

PO: 1-2 mg/kg/dose, adjust dose/frequency prn, usually q6-24h.

IV: 0.5-2 mg/kg/dose, adjust dose/frequency prn, usually q6-24h
or
begin at 0.1 mg/kg/hour and titrate to clinical effect
(maximum 0.5 mg/kg/h).

Hydrochlorothiazide

Thiazide diuretic.

PO: 2-4 mg/kg/day ÷ q12h.

Hydrocortisone

Corticosteroid.

Acute asthma:

IV: 5 mg/kg/dose q6h for 24-48 hours then reassess.

Anaphylaxis:

IV: 5-10 mg/kg/dose.

Anti-inflammatory:

IV: 2.5-10 mg/kg/day ÷ q6-8h.

Acute adrenal crisis:

IV: 1-2 mg/kg then:

Infants: 25-150 mg/day ÷ q6h.

Older children: 150-300 mg/day ÷ q6h.

Discontinuation of therapy >14 days requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy. Prolonged weakness may occur when corticosteroids are used concurrently with non-depolarizing neuromuscular blocking agents.

Ibuprofen

Analgesic and anti-inflammatory (NSAID).

PO: 5-10 mg/kg/dose q6-8h (maximum 2 400 mg/day).

Adverse effects include renal dysfunction, GI irritation and ulceration.

Weight (kg)	Single Dose (mg)
2.5 - 3.9	20
4.0 - 5.4	30
5.5 - 7.9	40
8.0 - 10.9	60
11.0 - 15.9	100
16.0 - 21.9	150
22.0 - 26.9	200
27.0 - 31.9	250
32.0 - 43.9	300
44 – over	400

Insulin

Recombinant human insulin.

Diabetic ketoacidosis:

IV: 0.05-0.1 units/kg/h initially. (add 25 units of regular insulin to 250 ml/NS)

For IV administration MUST use regular insulin.

Hyperkalemia:

IV: 0.1 units/kg AND dextrose 0.5 g/kg.

Diabetes mellitus:

SC: 0.3-0.5 unit/kg/day in divided doses (as a combination of short and long acting insulins). Adjust as required based on blood glucose measurements, usually 0.5-1 unit/kg/day.

With continuous infusions measure blood glucose q1h initially, adjust dose as required based on blood glucose measurements.

Ipratropium (Atrovent)

Inhaled anticholinergic bronchodilator.

Severe asthma:

NEB: 125-250 microgram (0.5-1 mL) q4-6h.

INH: 2-4 puffs q4-6h.

Higher doses may be required if administered through a ventilator due to loss of drug in the circuit.

Iron

Treatment of iron deficiency anemia:

PO: 4-6 mg/kg/day (of elemental iron) ÷ q8-24h.

Prevention of iron deficiency anemia:

PO: 2-3 mg/kg/day (of elemental iron) q24h.

Give with food if GI upset occurs.

Kayexelate® (Sodium Polystrene Sulfonate)

Cation exchange resin.

Treatment of hyperkalemia:

PO/PR: 1 g/kg/dose may be repeated prn (usual maximum 30-60 g/dose).

Give in water or juice, do mix with fruit juices with high potassium content such as orange juice.

Ketorolac (Toradol)

Analgesic and anti-inflammatory (NSAID).

IV/IM: 1-2 mg/kg/day (maximum 120 mg/day) ÷ q6h.

PO: 10 mg q6h (minimum weight 45 kg).

For oral use give ibuprofen or naproxen for younger children. There is limited experience with multiple dose ketorolac in pediatric patients. Adverse effects include renal dysfunction, GI irritation and ulceration.

Lactulose

Osmotic laxative.

PO: infants: 2.5-5 mL q8-24h.

children: 5-10 mL q8-24h.

adolescents: 15-30 mL q8-24h.

Lorazepam

Benzodiazepine sedative, anxiolytic and amnestic.

Status epilepticus:

IV: 0.1 mg/kg/dose, (usual maximum 4 mg/dose).

PR: 0.2 mg/kg/dose.

ICU Sedation:

IV/PO: 0.05-0.1 mg/kg/dose q1h prn +/- scheduled doses (may increase to 0.2 mg/kg/dose).

Intermediate duration of action and no active metabolites. Withdrawal may occur if discontinued abruptly after prolonged use. Not recommended for continuous infusion due to poor solubility. May give parenteral preparation rectally, diluted with water.

Methylprednisolone

Corticosteroid.

Acute asthma:

IV: 1-2 mg/kg/day q6h (max 60mg/day) until improvement seen (usually 24-48 hours) then q24h or switch or oral prednisone.

Anti-inflammatory:

IV: 1-2 mg/kg q24h.

High dose/pulse therapy:

IV: 10-30 mg/kg q24h x 1-3 doses.

Discontinuation of therapy >14 days requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy. Prolonged weakness may occur when corticosteroids are used concurrently with non-depolarizing neuromuscular blocking agents.

Metoclopramide

Antiemetic, gastrointestinal prokinetic agent.

IV/PO: 0.4-0.8 mg/kg/day ÷ q6h (usual maximum 40 mg/day).

Extrapyramidal reactions occur more commonly in children and may be treated with diphenhydramine.

Morphine
Narcotic analgesic.

Sedation/analgesia:

IV: 0.05-0.1 mg/kg/dose q2-4h and increase as required

or

0.1 mg/kg then 10-40 (usual maximum 100) microgram/kg/h. For breakthrough, use 1-1.5 times the hourly dose +/- increase the infusion.

Reduced doses may be required if used in combination with benzodiazepines. Use with caution in non-ventilated patients due to potential for respiratory depression. There is no upper dose limit if increased gradually. To prevent withdrawal, avoid abrupt cessation following high doses or long duration of therapy (> 5 days). Common adverse effects are puritis, nausea and constipation, which may be overlooked in PICU patients.

Improving the treatment of pain at McMaster Children's Hospital

Morphine is the preferred oral opiate for the treatment of acute pain

Morphine has important effectiveness and safety advantages and is preferred over codeine (which historically had been the most commonly used oral opiate at McMaster Children's Hospital). Codeine is a weak opiate analgesic with minimal intrinsic analgesic activity; it must first be metabolized to morphine which provides most of the analgesic effect. Because of the need for metabolism:

- Codeine has variable efficacy. Up to 10% of the population does not effectively metabolize codeine to morphine, resulting in poor pain control.
- Codeine has caused toxicity (including deaths) due to high levels of morphine in ultra-rapid metabolizers (up to 40% in some populations).
- Codeine has a higher potential for drug interactions than other opiates that may result in either reduced effectiveness or increased levels of morphine.

To avoid the unpredictably variable analgesia and potential for toxicity, a simpler approach is to use morphine.
Hydromorphone or oxycodone are alternatives for patients who cannot tolerate morphine because of adverse effects.

Dosing Of Oral Opiates

Opiate	Recommend Oral Dose (given q4h)	Usual Maximum Initial Dose	Formulations Available
Morphine	0.2-0.5 mg/kg	10-15 mg	1 mg/mL oral liquid 5, 10 mg tablets
Hydromorphone	0.03-0.08 mg/kg	2-3 mg	1 mg/mL oral liquid 1, 2, 4 mg tablets
Oxycodone	0.05-0.15 mg/kg	5-10 mg	5, 20 mg tablets
Oxycodone/Acetaminophen	30-44 kg: 1 tablet/dose > 44 kg: 1-2 tablets/dose		Oxycodone 5 mg with acetaminophen 325 mg tabs

***If the patient has a true morphine allergy please contact pharmacy**

Naproxen

Analgesic and anti-inflammatory (NSAID).

PO: 10-20 mg/kg/day ÷ q8-12h (maximum 1 g/day).

Adverse effects include renal dysfunction, GI irritation and ulceration.

Nebulized Hypertonic Saline

Mix 4mL of 3% Hypertonic Saline with
1.5mL of 1:1000 Epinephrine Solution*

Administer by Nebulizer Every 8 Hours
Until Discharge from Hospital

Omeprazole

Inhibitor of gastric acid secretion (proton pump inhibitor).

PO: 0.7-1.4 mg/kg/day ÷q12-24h (maximum 40 mg/day).

Do not give crushed tablets without sodium bicarbonate solution. An oral solution is available for doses other than 10 and 20 mg but is very unpalatable and should be given via feeding tube.

Ondansetron
Antiemetic.
IV/PO: 0.15 mg/kg/dose q8h (maximum 8 mg/dose).

Pantoprazole
Inhibitor of gastric acid secretion (proton pump inhibitor).
There is limited experience with pantoprazole in pediatric patients.
PO/IV: Adult dose: 40 mg q24h (maximum q12h),
1 mg/kg q24h has been used in pediatric patients.
<u>Major gastrointestinal hemorrhage:</u>
IV: Adult dose: 80 mg loading dose then 8 mg/h.
There is more data with the use of oral omeprazole in pediatric patients. Intravenous and oral pantoprazole provide equivalent acid suppression. Do not crush tablets.

Phenobarbital
Barbiturate anticonvulsant.
<u>Status epilepticus:</u>
IV: 15-20 mg/kg over 20-30 minutes.
<u>Maintenance:</u>
IV/PO: 3-5 mg/kg/day ÷ q12-24h.
Usual serum level for seizure control: 65-172 micromol/L (15-40 mg/L).

Phenytoin
Anticonvulsant, antiarrhythmic.
<u>Status epilepticus:</u>
IV: 15-20 mg/kg over 20 minutes.
<u>Maintenance:</u>
IV/PO: 5 mg/kg/day (range 3-10 mg/kg/day) ÷ q8-12h.
<u>Anti-arrhythmic:</u>
IV: 1.25 mg/kg q5min until arrhythmia suppressed (maximum of 15 mg/kg total dose),
or
15 mg/kg over 20 min.

May require higher doses for patients with head injuries. Must be diluted in saline only and requires in-line filter (0.22 micron). Hold feeds before and after enteral administration as continuous feeds and formula may decrease bioavailability of oral products. Significantly increased free fraction in patients with hypoalbuminemia may result in underestimation of effective drug concentration and difficulty in interpretation of drug levels and toxicity may occur at "therapeutic" serum levels. Therapeutic level: 40-80 micromol/L (10-20 microgram/mL).

Piperacillin
Broad spectrum penicillin.

IV: 200-300 mg/kg/day ÷ q6h (maximum 16 g/day).

Adjust dose interval in severe renal impairment. Active against Pseudomonas aeruginosa.

Piperacillin/Tazobactam
Broad spectrum penicillin with beta-lactamase inhibitor.

IV: 200-300 mg/kg/day (of piperacillin component) ÷ q6-8h.
Max dose is 4.5 g (4 g piperacillin + 0.5 g tazobactam) q8h

Order in mg or g of piperacillin, for example, give piperacillin/tazobactam (as x mg of piperacillin component) IV q8h. Adjust dosage interval for patients with severe renal impairment. Active against gram positive, (including S. aureus), gram negative and anerobic organisms.

Potassium Chloride
Electrolyte.

<u>Treatment of hypokalemia:</u>
PO: 1-2 mEq/kg/day ÷ q6-12h.
IV: 0.25-1 mEq/kg/dose.

Risk of arrhythmias and cardiac arrest with rapid IV administration.
Dose recommendations assume normal renal function. Maximum rate of administration in PICU is 0.5 mEq/kg/h (maximum 20 mEq/h). Use 0.1 mEq/mL for peripheral use, 0.2 mEq/mL for central lines. For maintenance fluids the usual maximum concentration for a peripheral IV is 40 mEq/L.

Prednisone or Prednisolone

Corticosteroid.

Acute asthma:

PO: 1-2 mg/kg q24h.

Anti-inflammatory or immunosuppressive:

PO: 0.5-2 mg/kg 24h, dose may be tapered as tolerated.

1 mg Prednisone = 1 mg Prednisolone. Discontinuation of therapy >14 days requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy. Prolonged weakness may occur when corticosteroids are used concurrently with non-depolarizing neuromuscular blocking agents.

Racemic Epinephrine

See epinephrine.

Ranitidine

H_2 receptor antagonist.

Reduction of gastric acid secretion:

IV: 2-6 mg/kg/day ÷ q6-12h (usual maximum 50 mg q6-8h).

PO: 4-10 mg/kg/day ÷ q8-12h (usual maximum 300 mg/day).

IV dose is approximately 50% of oral dose. Modify dosage interval for patients with renal impairment. May add daily dose to TPN.

Salbutamol (Ventolin)

Bronchodilator, β_2 agonist.

Acute asthma:

MDI: start at 2-4 puffs q20-60min prn. Higher doses may be required if administered through a ventilator due to loss of drug in the circuit.

NEB: 0.01-0.03 mL/kg/dose (5 mg/mL solution, maximum 1 mL) in 2-3 mL NS q½-4h, may give continuously if required.

IV: 1 microgram/kg/min, increase q15min prn to maximum of 10 microgram/kg/min.

Maintenance therapy:

MDI: 1-2 puffs q4h prn.

Acute treatment of hyperkalemia:

IV: 4 microgram/kg over 20 min.

Titrate dose to effect and/or adverse effects (tachycardia, tremor and hypokalemia). For most patients metered dose inhalers with a spacer device are the preferred method of drug delivery. Wet nebulization is less efficient and more costly. Monitor serum potassium, especially with IV. Cardiac monitoring required for IV use.

Senna

Stimulant laxative.

PO: infants: 1 or 2.5 mL (1.7 or 4.25 mg) q24h.
children: 2.5 or 5 mL (4.25 or 8.5 mg) q24h.
adolescents: 5 or 10 mL (8.5 or 17 mg) q24h.

Some patients, particularly those receiving opiates may require higher doses and/or more frequent administration. Also supplied as 8.6 mg tablets.

Spironolactone

Potassium sparing diuretic.

PO: 1-3 mg/kg/day ÷ q8-24h.

Valproic Acid and Derivatives

Anticonvulsant.

PO: 15-20 mg/kg/day increased to a maximum of 30-60 mg/kg/day ÷ q6-12h.

IV: Divide total daily maintenance q6h.

Desired therapeutic range: 350-690 micromol/L (50-100 microgram/mL). Dosing is equivalent for valproic acid, divalproex and sodium valproate.

Vitamin K

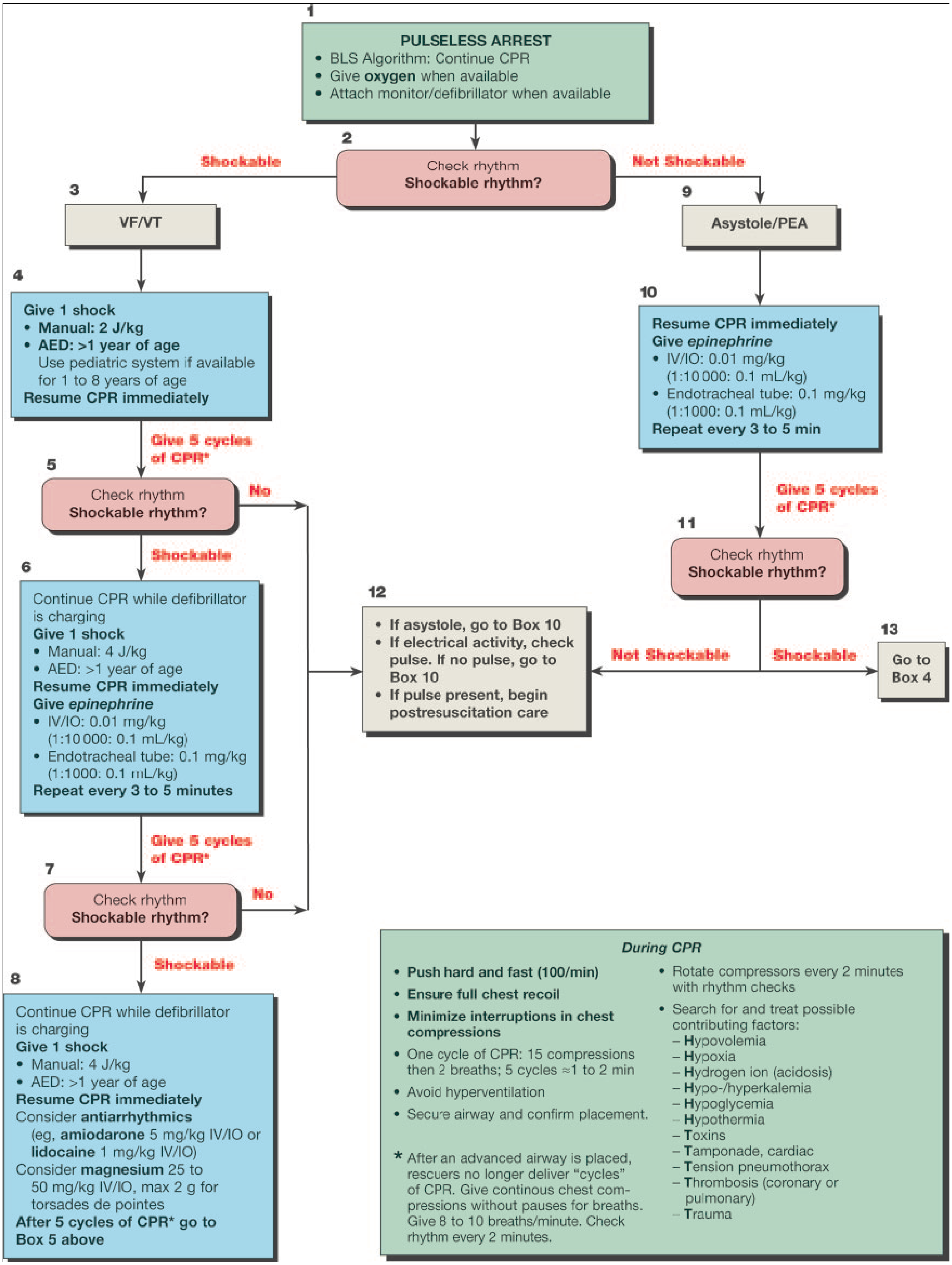
Reversal of prolonged clotting times or warfarin induced anticoagulation.

IV/PO: 0.5-10 mg/dose.

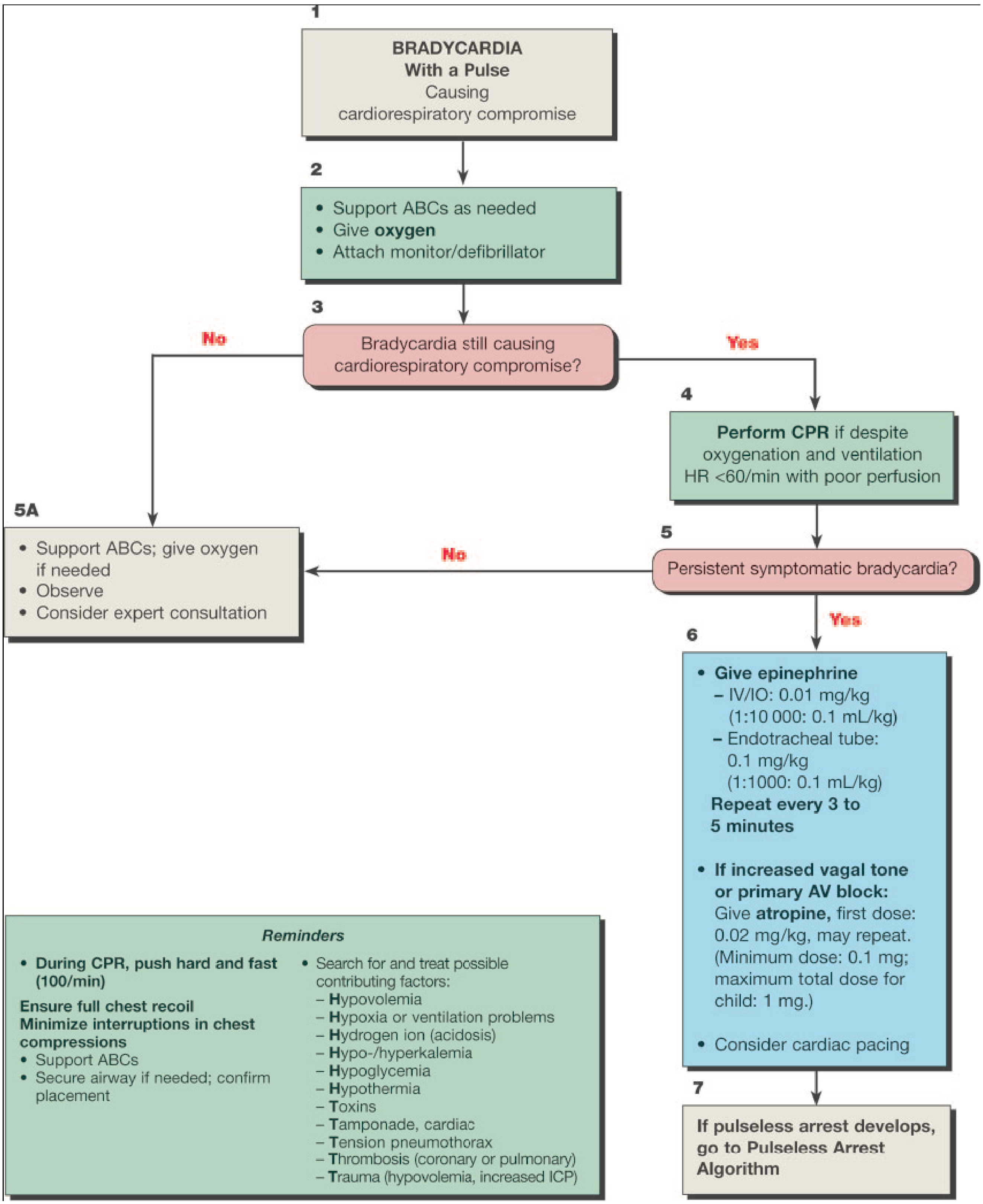
Use lower doses if there is no significant bleeding and patient will require warfarin in the future. May repeat in 6-8 hours. Injection may be given by mouth, undiluted or in juice or water.

PEDIATRIC EMERGENCY MEDICINE

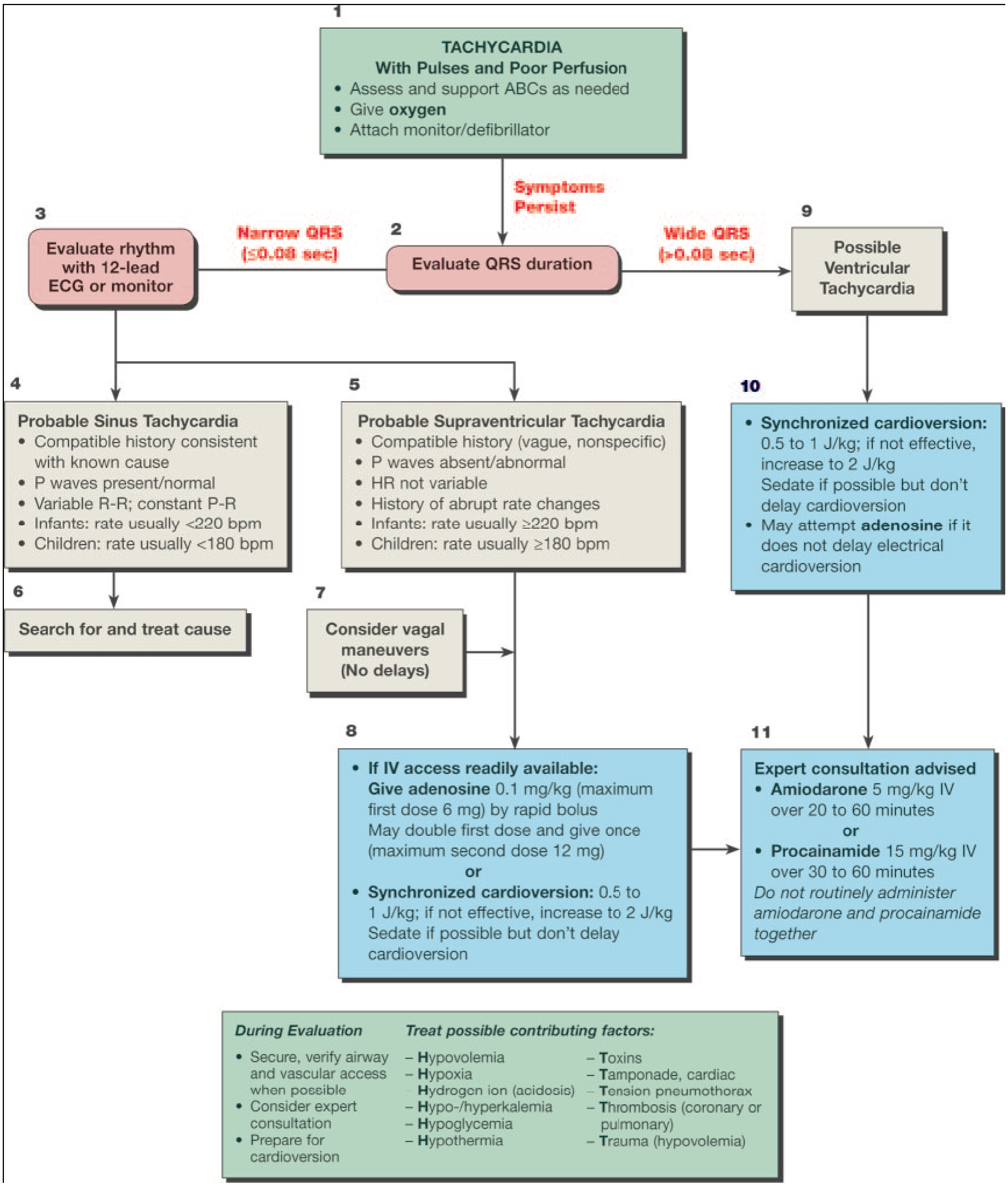
PALS: PULSELESS ARREST ALGORITHM



PALS: BRADYCARDIA ALGORITHM



PALS: TACHYCARDIA ALGORITHM WITH PULSES AND POOR PERFUSION



PALS Medications for Cardiac Arrest and Symptomatic Arrhythmias

Medication	Dose	Supplied	Administration
Adenosine	IV/IO: **0.1 mg/kg** Max 6 mg Repeat dose: **0.2 mg/kg** Max 12 mg	3 mg/mL: 0.03 mL/kg Max 2 mL Repeat dose: 0.07 mL/kg Max 4 mL	Rapid bolus followed by rapid flush
Amiodarone*	IV/IO: **5 mg/kg** (Max 300 mg)	50 mg/mL: 0.1 mL/kg Max 6 mL	Rapid bolus for VF/VT, over 20-60 minutes for perfusing tachycardias
Atropine	IV/IO: **0.02 mg/kg** Min 0.1 mg Max 0.5 mg for child Max 1 mg for adolescent	0.1mg/mL: 0.2 mL/kg	Bolus
	ET: use 2-10 times IV dose		Dilute with NS to 3-5 mL
Calcium Chloride	IV/IO: **20 mg/kg**	10% solution: 0.2 mL/kg	Give slow push, central line preferred
Dextrose	IV/IO: **0.5-1 g/kg**	$D_{10}W$: 5-10 mL/kg $D_{50}W$: 1-2 mL/kg	Avoid hyperglycemia
Epinephrine	IV/IO: **0.01 mg/kg**	1:10 000: 0.1 mL/kg	Bolus
	ET: **0.1 mg/kg**	1:1 000: 0.1 mL/kg	Dilute with NS to 3-5 mL

PALS Medications for Cardiac Arrest and Symptomatic Arrhythmias

Medication	Dose	Supplied	Administration
Lidocaine	IV/IO: **1 mg/kg**	20 mg/mL: 0.05 mL/kg	Bolus
	ET: use 2-10 times the IV dose		Dilute with NS to 3-5 mL
	IV/IO Infusion: **20-50 microgram/kg/min**	Add 100 mg to total of 100 mL	Run at 1.2 - 3 mL/kg/h
Magnesium Sulfate	IV/IO: **25-50 mg/kg** (max 2 g)	0.5 g/mL: 0.05-0.1 mL/kg (max 4 mL)	Rapid infusion for torsades or severe hypomagnesemia
Naloxone	IV/IO/IM: **0.1 mg/kg** (max 2 mg)	0.4 mg/mL: 0.25 mL/kg (max 5 mL)	Bolus
	ET: use 2-10 times the IV dose		Dilute with NS to 3-5 mL
Procainamide*	IV/IO: **15 mg/kg** ***do not routinely use in Combination with other drugs that prolong QT interval**	100 mg/mL: 0.15 mL/kg (max 10 mL)	Give over 30-60 minutes
Sodium Bicarbonate	IV/IO: **1 mEq/kg**	4.2%: 2 mL/kg 8.4%: 1 mL/kg	Give slowly and if ventilation is adequate. Use 4.2% in neonates
Cardioversion	0.5 J/kg, double dose if arrhythmia continues		
Defibrillation	2 J/kg initially then 4 J/kg for each subsequent defibrillation attempt.		
ETT size	(age in years /4) + 4		

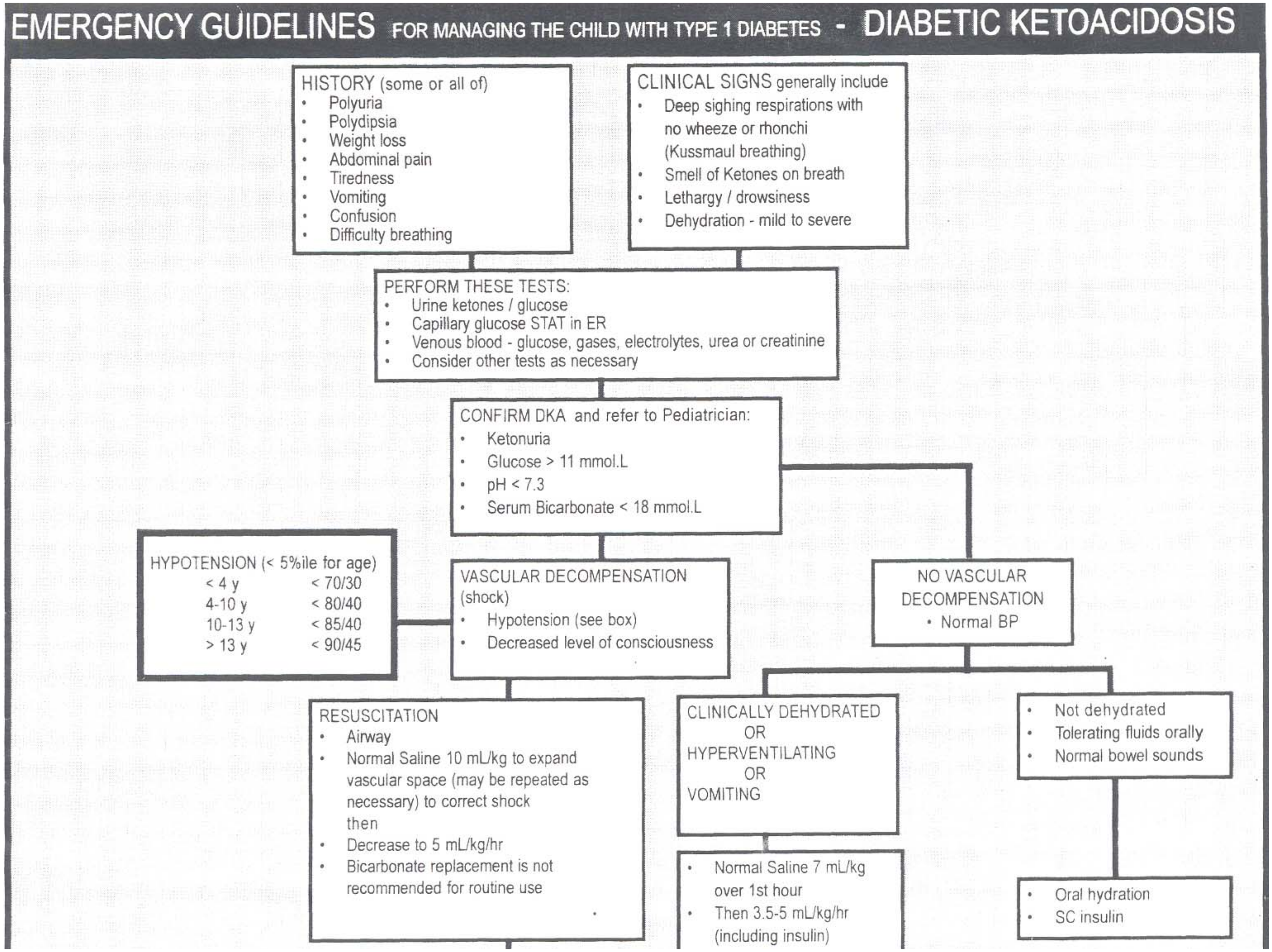
STATUS EPILEPTICUS IN INFANTS & CHILDREN THERAPEUTIC GUIDELINES

TIME	ACTION
0 – 5 mins	Assess Cardio-Respiratory function. Open airway, provide O_2 REMAIN WITH PATIENT Apply cardiac and oximetry monitors. Frequently reassess airway & oxygenation
5-10 mins	ESTABLISH IV ACCESS (use intra-osseous if unable to get IV) **FIRST DRUG:** each given over 1 minute LORAZEPAM (LZ) IV 0.1 mg/kg (1st choice) OR DIAZEPAM (DZ) IV 0.25 mg/kg **IF NO IV:** RECTAL administration of LZ or DZ at double the dose OR IM MIDAZOLAM 0.25-0.5 mg/kg Note: Diazepam and Midazolam must be followed by loading dose of Phenytoin (see below) DRAW BLOOD: cap glucose (BS), gases, lytes, Ca, Mg ± toxin screen ± Anti-Epileptic Drug (AED) levels START IV INFUSION 0.9 NaCl + Bolus of D25W 2mL/kg if immediate BS result is not available
10 -15 mins	MONITOR VITAL SIGNS Reassess airway, possible need for intubation. Lower body temperature if > 39 °C If available, administer PYRIDOXINE 200 mg IV before long half-life anticonvulsants are given to infants < 2years of age **Repeat LORAZEPAM or DIAZEPAM** dose once 5 minutes after first dose
15- 30 mins	**SECOND DRUG:** PHENYTOIN IV 20mg/kg in saline line (glucose will cause it to precipitate) Give over 20 minutes. Monitor vital signs. If seizure does not stop, give extra 5 mg/kg IV Contact tertiary referral centre/ PICU DO NOT TRANSFER IF STILL CONVULSING! **THIRD DRUG:** PHENOBARBITAL IV 20mg/kg over 20 minutes. Monitor vital signs. Watch for apnea, especially with benzodiazepines. May repeat Phenobarbital 10mg/kg twice

STATUS EPILEPTICUS IN INFANTS & CHILDREN THERAPEUTIC GUIDELINES (CONTINUED)

30-60 minutes	Mandatory **Intubation** (Rapid Sequence Intubation) and Ventilation Monitor in PICU ***MIDAZOLAM* INFUSION**: Load 0.15mg/kg, then infuse at 1-2mcg/kg/min Titrate q15mins increasing by 1mcg/kg/min as needed until seizures controlled Mean range 2-4mcg/kg/min. Watch BP. **BARBITUATE ANAESTHESIA:** *THIOPENTAL* (Pentothal): Load 3-5mg/kg (1.5 mg/kg/min). May repeat x2. Infusion 25-400 mcg/kg/min. (For burst suppression may need levels of 250 mcg/L or 1000 mmol/L). Titrate to response. Watch for hypotension (common!), use inotropes PRN. *PENTOBARBITAL* (Nembutal): Load 3-5mg/kg over 20 minutes. May repeat x2. Infusion 1-3mg/kg/hr (to maintain EEG burst suppression levels 10-25mcg/ml). At 25mcg.ml there is consistent burst suppression but 60% of patients are hypotensive! Use inotropes early!
NOTE:	• **Attention to ABCs before treating the seizure.** • **Stop seizures ASAP.** • **Do not transfer without loading Phenytoin ± Phenobarbital** • **Always communicate with tertiary referral centre**

DIABETIC KETOACIDOSIS EMERGENCY GUIDELINES



Continuous insulin infusion 0.1 units/kg/hr = 1 mL/kg/hr (of solution of 25 units of Regular Insulin in 250 cc NS)

- DO NOT GIVE BOLUS OF INSULIN
- Start Pediatric Diabetic Ketoacidosis Flowsheet

If history of voiding within last hour and [K+] < 5.5 mmol/L:

- Add 40 meq/L of KCl to IV fluid

NEUROLOGICAL DETERIORATION
Headache, irritability, decreased level of consciousness, decreased HR, seizure, hypothermia

First rapidly exclude hypoglycemia by capillary blood glucose measurement
THEN
Treat for cerebral edema

ACIDOSIS NOT IMPROVING
(in 3-4 hours)

- Check insulin delivery system and net fluid balance
- Consider sepsis
- Contact Tertiary Pediatrics Diabetes Centre

ACIDOSIS IMPROVING BUT
Blood glucose < 15 mmol/L OR
Blood glucose falls > 5 mmol/L/h:

- Change IV to D5/normal saline
- Decrease insulin to 0.04-0.05 U/kg/hr = 0.4-0.5 mL/kg/hr of standard solution as above
- If Blood glucose < 10mmol/L change to D10/normal saline

TREATING CEREBRAL EDEMA

- 20% Mannitol 5mL/kg over 20 minutes
- If measured Na has declined administer 2-4 mL/kg of 3% saline over 10-20 min then resume normal saline rehydration
- Decrease insulin to 0.04-0.05 U/kg/hr = 0.4-0.5 mL/kg/hr standard solution as above
- Contact Tertiary Pediatric Diabetes Center
- Admit to ICU

Clinically Improved, tolerating oral fluids, pH > 7.3, HCO_3 > 18 mmol/L:

- Start SC insulin
- Stop IV insulin 1/2 hour after SC dose of Humalog insulin or 1 hour after SC dose of regular insulin
- Determine cause of DKA
- Contact Tertiary Pediatric Diabetes Center

OBSERVATION AND MONITORING

- Hourly blood glucose (capillary)
- Aim for a decrease in blood glucose of 5 mmol/L/h, and pH increase of 0.03 units/h.
- Hourly documentation of fluids input/output
- Hourly, at least, assessment of neurological status
- 1 hour after start of IV - electrolytes, venous gases - then q2h or more frequently if indicated
- Follow Effective Osmolality = (2X measured Na + measured blood glucose)
- Avoid a decrease of > 2-3 mmol/L/hr in effective osmolality by increasing IV sodium concentration
- Timely consultation with pediatric endocrinologist

Adapted from 2001
Ministry of Health Guidelines

Normal Pediatric Vital Signs

Age (kg)	Pulse	Respirations	Systolic Blood Pressure*
Preterm (1-2)	120-160	30-60	50-70
Newborn (3)	120-160	30-60	60-70
3 mo (5)	120-160	30-60	60-70
1yo	120-160	30-60	70-80
3 yo	90-140	25-40	76-90
6 yo	80-120	22-34	80-100
8 yo	80-120	16-24	84-110
10 yo	60-100	16-20	90-120
12 yo	60-90	14-20	90-120
14+ yo	60-90	12-20	90-130

* Blood Pressure is a late and unreliable indicator of shock in children.

Glasgow Coma Score

	Infant	Child/Adolescent	
Eye Opening	Spontaneous	Spontaneous	4
	To voice	To voice	3
	To pain	To pain	2
	None	None	1
Verbal Response	Babbles, easily consoled	Oriented	5
	Irritable, difficult to console	Confused	4
	Cries to pain	Inappropriate	3
	Moans to pain	Garbled	2
	None	None	1
Motor Response	Normal movements	Obeys commands	6
	Withdraws to touch	Localizes pain	5
	Withdraws to pain only	Withdraws to pain	4
	Flexion (decorticate)	Flexion (decorticate)	3
	Extension (decerebrate)	Extension (decerebrate)	2
	None	None	1

Temperature Conversion

Fahrenheit - Celsius	Fahrenheit - Celsius
106°F = 41.1°C	100°F = 37.8°C
105°F = 40.6°C	99°F = 37.2°C
104°F = 40°C	**98.6°F = 37°C**
103°F = 39.4°C	98°F = 36.7°C
102°F = 38.9°C	97°F = 36.1°C
101°F = 38.3°C	96°F = 35.6°C

(Fahrenheit T° - 32) x 5 ÷ 9 = Centigrade T°
(Centigrade T° x 9 ÷ 5) + 32 = Fahrenheit T°

Maintenance Fluid Requirements

Weight	Hourly Fluid Rate	Example
0-10 kg	4 cc/kg/hr	6 kg x 4=24 cc/hr
10-20 kg	4 cc/kg/hr for first 10 kg	10 kg x 4=40 cc/hr
	2 cc/kg/hr for remaining kg	5 kg x 2=10 cc/hr
		15 kg maint.=50 cc/hr
>20 kg	4 cc/kg/hr for first 10 kg	10 kg x 4=40 cc/hr
	2 cc /kg/hr for next 10 kg	10 kg x 2=20 cc/hr
	1 cc /kg/hr for remaining kg	5 kg x 1=5 cc/hr
		25 kg maint.=65 cc/hr